61203

REGISTER

OF THE

ARTS AND SCIENCES.

VOLUME THE SECOND,

CONTAINING

A CORRECT ACCOUNT OF SEVERAL HUNDRED OF THE MOST IMPORTANT AND INTERESTING

INVENTIONS, DISCOVERIES,

AND

PROCESSES.

ILLUSTRATED

WITH UPWARDS OF ONE HUNDRED ENGRAVINGS.

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INDEX.

Advertising Machine, Harris's Patent, with an Engraving, 130.
Aerostation, Capacity, &c. of Balloons, 55.
Alarum, proposal to be used at Sea, 149.
——— Plan for the construction of, with an Engraving, 216.
Ammonia, action of, on copper, 31.
——— Disengagement of during Vegetation, 62.
Amputation, Instrument for the purpose, 286.
Anchor, new mode of *purchasing*, 163.
——— Hawkes's Patent, with Engraving, 210.
——— Further observations on, 230.
Anatomical subjects, new mode of preserving, 367.
Art, curious work of, 135.
Arsenic, detection of, as a Poison, 175.
Artillery, a new piece of, 190.
Attraction, capillary, 358.
Atomic weights of Acids, 79.
Aurora Borealis, 78—Artificial Imitation of, *ib.*—Observations upon in Iceland, 95.
Auger, Church's New Patent, 285.
——— described, with Engravings, and the originality of invention disputed, 374.

Balloons, proposed improvements in, with Engraving, 184.
Beer, Dickenson's Apparatus for clearing, 214.
Bell-Cranks, Burt's Patent, with Engraving, 324.
Birds, mode of preserving, 189.
Blow-Pipe, description of a self-acting, 117.
——— Improved Safety-Chamber to the Oxy-Hydrogen, with Engraving, 294.
Blood, use of, in Painting, 254.
Blacking, Bracconet's process for making it superior and cheap, 271.
Bones, antediluvian, 142.
Boots and Shoes, Holland's Patent, 228.
Boats, novel means of propelling, with Engraving, 297.
Boring the Earth, Good's Patent Implements, with Engravings, 114
Book-Binders' Folder, with Engraving, 199.
Brick-Making Machine, Cundy's Patent, with Engraving, 305.
Brick-Houses, renewing the surface of, 303.
Bridge, Smart's Patent Iron, with Engravings, 50.
Breakwater, Floating, White's Patent, 27, 37.
Bushel, the new standard for heaped measure, 61.
Butter, Tartarian method of preserving, 78.

Carriage, Gordon's Patent, with Engravings, 34.
——— Gordon's Patent Locomotive Coach, with Engravings, 322.
——— James's Patent Locomotive, 341.
——— Gas Engine, Do., 22, 107.
Carding Machines, Patent Improvements in, 6.
Caoutchouc, or Indian Rubber, how obtained, 15.
——— Patent preparation of, 132.
Cabbage-Red, preservation of Colour in Alcohol, 250.
Calves, rearing of upon Fiorin tea, 286.
Cement, Apsdin's Patent process for making artificial stone, 166.
Centrifugal Check-Hooks, improved, with Engraving, 279.
Chromate of Iron, in Scotland, 62.
Chemical Society, inauguration of the New London, 120.

Charcoal, remedy for pernicious effects of burning in close rooms, 223—Remarks thereon, *ib.*—Examination of fused Charcoal, 350.
Chica, Indian, employed in dyeing, 286.
Chucks, concentric, for Turners, with Engravings, 359.
Circular Chimney Flues, *recommended*, 188.
Coffee-Roasting, Evans's Patent Machinery, with Engravings, 1.
Coating for specula, 95.
Copper, Mushet's Patent alloyed, for Ships' bottoms, 99.
——— Ammoniacal chromate of, 351.
Composition, Hancock's Patent for preserving ropes, canvas, wood, &c., 100.
——— Mackintosh's Patent, for making cloth water-proof, 131.
——— Anti-incendiary, 343.
Comet, newly discovered, 335.
Comets, effects of upon the Sun, 286.
Cowl, Ayliffe's smoke preventive, 313.
Clouds, classification of, 70.
Clockwork, by M. Serviere, 286.
Cranks, Burt's Patent, with Engraving, 324.
Crimping, Turner's Patent Apparatus, 330.

Diorama, 287.
——— Description of the Patent machinery, with Engravings, 338.
Drying, Southwold's Patent machinery for drying by Steam, 165.
Dry-Rot, means of prevention, with Engravings, 85.

Ear-Trumpet, Dr. Morrison's, 251.
Earthquakes, on the cause of, 254.
Electric Fluid, motion of, 189.
Electricity, discriminated by the taste, 75.
Elderberries, useful as a chemical test, 189.
Education of the People, Mr. Brougham's Pamphlet on, 236.
Engraved-Copper-Plates, preservation of, 63.
Engraving, Bromley's portrait of Mr. Abernethy, 274.
Etching on Steel Plates, Mr. Warren's process, 92.
——— ——— Caution respecting an explosive menstruum, 215.
Erlanite, a new mineral, 191.
Evaporator, portable, with Engraving, 41.

Fermenting Apparatus, Deurbroucy and Nichols's Patent, with Engraving, 290.
Filtering Machine, improved, with Engravings, 39, 103.
Fire Engine, the Marquis Orego's, 95.
——— Barton's Patent, with Engraving, 247.
Fire-Proof-Houses, Farrow's Patent, with Engraving, 274.
Fire-Escape, plan of, with Engraving, 217.
——— Gregory's Patent, with Engravings, 136.
Fire-Damp, on the cause of, and means of preventing danger from in mines, 181.
Fire-Boxes, to make the chemical, 335.
Fiery eruption in America, 63.
Fish, preservation of, during carriage, 175.
Fishing, through the Ice at Hudson's Bay, 128.
Fids for topmasts, Rotch's Patent, with Engraving, 233.
Fleas, Snow, in Canada, 63.
Flowers, German method of making grow in winter, 191.
Flax, culture of the new Zealand, 253.
Forge, Spencer's Patent with Engraving, 230.
Fruit, to expedite the ripening of, 352.
Fusible metal, 15.

Gas, comparative experiments on the illuminative powers of Oil and Coal Gas, 52.
—— Portable Gas Light Companies, 38.
—— Provincial do. 221.
—— curious properties of, 254.
—— a Steeple-clock lighted with, 350.
Gas Tubes, Russell's Patent, 178.
Gas Vacuum Engine, observations on, 219, 261.
Gallon, the new standard, uniform measure of capacity, 61.
Galvanism, the Discovery of, 143.
Glass, process of colouring, 31.
—— manufacture of Flint Glass for optical purposes, 318.
Gum, new patent substitute for, 91.

Gun, Perkins's Patent Steam, with Engravings, 105.
Gun and Mortar Boat (Carey's) with Engravings, 23.
Gun, canon a bombes, 190.
Gunnery, experiments at Woolwich, 128.
Gunpowder Mills, means of preventing explosions in, 33.
Grafting, improvements in, 287.

Hats, Lloyd & Co's Patent, 199.
Hearth, Chater's Patent Ship's Steam Cooking Apparatus, 153.
Heat, quantity of disengaged during Combustion, 350.
Honey Vinegar, 14.
Hose, for fire-engines, improved, 69.
Horse Shoes, Dickenson's Patent, with Engravings, 81.
Ditto do. remarks thereon, 119.
Horticulture, on grafting, 287.
Hydrogen, sulphuretted, inflamed by nitric acid, 62.
——— pure, means of obtaining, 62,
——— Gas, on the illuminate powers of, 52.
Hydrophobia, experiments on, 207.

Ice-caves, natural, 173.
Ignis Fatuus, cause of, 31.
Inundations in the Baltic, 302.
Ink, to make indelible marking, 335.
—— Indian, to make, 335.
Indigo, composition of, 351.
Iron, red-hot, observation on, 78.
—— combustion of, by sulphur, 111.
—— method of browning gun barrels, &c. 366.
—— exposure of to air in high regions, 367.

Keels, moveable, for navigating shoal water, not a new invention, 287.
Knobs, Day's Patent for casing them, 229.

Lava, account of that thrown out by burning mountains, 27.
Ladders, Gregory's Patent, with Engravings, 136.
Lapidaries' work by the Hindoos, 285.
Lace of Buckinghamshire, sold as French, 208.
Leaping-bar, Mr. Dickenson's, with Engravings, 82.
Leather, Gunby's Patent substitute for, 68.
Leather, new substitute for, by which shoes and boots are cast when in a fluid state, 271.
Letter-copying, simple apparatus for, with engraving, 344.
Light, observations on, by Count Rumford, 16.
—— produced by crystallization, 190.
—— of the glow-worm, inquiry into, 70.
—— to measure the intensities of, 309.
—— instantaneous to obtain, 334.
—— of the Moon and Planets, cause of, 175.
Life-preserver from drowning, 26.
Looms, power, calculation of their produce, 15.
Lock, Duce's Quadruple Lock, with Engraving, 311.
London Mechanic's Institution, Sir F. Burdett's munificence thereto, 172.

Magnetism, Barlow's neutralizing plate, 30.
——— Scoresby's Experiments on, ib.
——— mathematical theory of, 77.
Masticator, Mr. Dickenson's Invention for feeding horses, with Engraving, 84.
Masts for Ships, rendered portable, 208.
Marbles, imitations of in wood, 311.
Mercury, to render solid, 15.
Metals, density of influenced by the mode of casting, 69.
Mexican Mines, produce of, 110,139.
Mimosa-bark, employment of, for tanning, 90.
Moisture, mechanical force exerted by, 366.

Natural Philosophy. Optics, 12, 28, 46, 76.—Of Burning Glasses, 93.—Of Telescopes, 158, 171, 205.—Of the Magic Lantern and Phantasmagoria, 206.
Naptha Lamps, the burning of in mines, preferable to oil, 361.
Nails, adhesion of in wood, 164.
Nankeen, the dye for, 335.

Oak Timber, a new mode of preparing, to prevent the dry-rot, with Engravings, 85.

Oil-pressing Mill, Hall's Patent, with Engravings, 168.
Oil of Laurel, native, 63.
— remarkable properties of, 71.
Opodeldoc, composition of, 335.
Organs, Wheatstone's Patent, 318.

Parachute, on a new, 11.
Paragrandine, for averting hail-storms, 13.
Painting in Miniature, remarks on, 348.
Paper, effacing of grease spots from, 349.
Patents, Lists of, 16, 32, 64, 80, 96, 112, 128, 143, 160, 176, 192, 208, 224, 240, 256, 272, 288, 304, 320, 336, 352, 363.
——— French, 23, 94.
Perpetual Motion, pretended, 31.
Perspiration, nature of the vapour, 31.
Pearls, artificial, manufacture of, 132.
——————— at Rome, 199.
———, natural, forced in China, 246.
Phosphurus, experiments with, 78.
Philotechnic Society, formation of, 269.
Piano Fortes, Wheatstone's Patent, 318.
Plaister, Court, Sticking, 64.
Plate, a new metallic compound in imitation of, 111.
Plants, Marine, 142.
——— fresh water, ib.
——— Geography of, 304.
Planes, Gladwell's improved, with Engravings, 296—Remarks on, 334.
Planets, comparative magnitude of, 335.
Possor, substitute for the spade, with Engraving, 57.
Pound, the new standard weight, 61.
Potatoes used as a substitute for soap, 63.
Portfolio, Dixon's improved, with Engraving, 201.
Power, Mr. Russell's new mechanical power, with Engravings, 258.
Printing Machine, Mr. Miller's Patent, with Engraving, 120.
Premiums, offered by the Society of Arts, 16, 32, 64, 79, 96, 112, 143, 160, 175.
Provisions, method of preserving at Hudson's Bay, 29.
Pump,—the new Fire-Pump, at Aldgate, with Engraving, 98.
Pumps (a Ship's) new method of working by means of the capstan, with Engraving, 8.
——— another method, 163.
——— new portable, Tyro's patent, 303.
——— Clark's quicksilver, with Engraving, 328.

Queries on various subjects, 79, 85, 127, 302, 319, 335.

Railway, Palmer's patent Suspension 72, 150.
——— Opening of, at Cheshunt, with Engraving, 354.
——— On a new principle, 198.
——— James's Patent, with Engraving, 241.
Railways, Table of resistance upon, 152.
——— Companies, Observations on, 183.
Razors, patent invention of, 187.
——— easy means of sharpening, 367
Rain, great fall of at Manchester, 287
Red Cabbage infusion, an *old* chemical test, 250.
Rio Vinagro, in South America, 111.
Roofs, covering for, 347.
Rugs, patent process in making Sheep skin Rugs, 9.

Sailing Vessels, Clint's Balancing Masts for, with Engravings. 25.
Salt-Pans, Jump and Court's Patent, 359.
Saw, Circular, extraordinary application in Surgery, 39.
Scabbards and Sheaths, Gunby's Patent, 202.
Screw-wrench, improved, by Mr. Eddy, 281.
——— by F. Watt, 282.
Sea, advances and recessions of, 174.
—— evaporation of, 255.
—— wall, mode of embankment, 256.
Ships, flat-bottomed, remarks on, 146.
Ships' Hearths, Chater's Patent, with Engraving, 153.
Sheathing, Pope's Patent Metallic, 213
——— Mushet's Patent alloyed Copper, 99,
Silvering of Copper, 15.
Silk, culture of in the Isle of France, 307.
—— on the state of the British Manufacture, 355.
Smoke Preventives, with Engravings, 55, 104, and 313.

Smoke, Higgins's Patent for Consuming of, 301.
Snow on the Cordilleras des Andes, 141
—— red, observations on, 111.
Soda Water, to make, 335.
Society Royal, election of Officers, 120
Sponge, method of Bleaching, 188.
Splitting Machine, for dividing Skins edgewise, or in the direction of the surface, with Engravings, 185
Steam Sugar Boiler, Smith's Patent, with Engraving, 10, 17.
——— Engine, Vaughan's Patent, with Engravings, 66.
——— Remarks on, 91, 218.
——— Engine Boiler, Smith's Patent, with Engraving, 89.
——— Table of the Pressure and Temperature of Steam, 167.
——— Engines, number and power employed in Great Britain, 95.
——— Gun, Perkins's Patent, with Engravings, 105.
——— Washing Company, Letter on, 123.
——— Engine Boilers, Horton's Patent, with Engravings, 146.
———————— French Measures to prevent accidents from the bursting of, 166.
——— Chambers, M'Curdy's Patent, with Engravings,, 178.
——— Engine Boilers, Barton's Patent, with Engraving, 194.
——— Engine, Chapman's method of consuming the Smoke of the Furnaces, with Engraving, 226.
——— Engine Boilers, with self-acting Feeders, with Engraving, 249.
——— Mr. Evans's novel and important application of, 359.
——— Rockets and Shells, Perkins's Patent, with Engraving, 369.
Steel, process of making by cementation, 31.
—— damasked, preparation of, 170
—— mode of tempering for various purposes, with precision, by the thermometer, 254.
Stone, Dallas's Patent Mason's Apparatus, 301.
Stop-cock for corrosive fluids, 229.
Stuffs, to give a lustre to, 78.
Sugar-cane, culture of, with Engraving, 18.
———— Crushing-mill, with Engraving, 19.
———— process of manufacture, 28
———— Steam Boiler, Smith's Patent, with Engraving, 10.
Sugar, Cleland's Patent Crystallizing Apparatus, 212.
Sun, temperature of, 190.
Syphon, description of Bunter's, 73.
———————— Hempel's, *ib.*
Syringe Cock, with Engravings, 148.

Tabasheer, remarkable properties of, 140.
Tanning, method of preparing the Mimosa Bark for, 303.
Telegraphic Communication, Mr. Vallance's Patent, with Engravings, 261, 276.
Tea, adulteration of, in China, 160.
Timber Steam-kilns, improvement in, 38.
Topmasts, Mr. Smart's mode of fidding, with Engraving, 345.
Travelling, Mr. Vallance's proposed mode of, 325.
Trees, curious Italian method of planting through them, 207.
Tubes, on the formation of flexible elastic Tubes, 357.

Vacuum Engine, Brown's Patent, 3, 219, 260, 294.
——— Mr. Russell's proposed New Power, with Engravings, 244.
——— correspondence thereon, 283
Vapour, Jeffery's method of condensing Smoke, Metallic Vapours, &c. 275.
Vermin, preparation for the destruction of, and the pickling of seed wheat, 222.
Umbrella Coverings, Foot's Patent, 23

USEFUL ARTS, Encyclopædia of

Albumen, 43.
Alcohol, 44.
Ale, 58.
Alegar, ..
Alembic, ..
Alembroth, 59.
Algaroth, ..
Alkahest, ..
Alkali, ..
Allegias, 73.
Alloy, ..
Aloes, 75.
Alquifou, 108.
Aludels, ..
Alumina, ..
Alum, ..
—— 124, 133.
Amalgam, 133.
Amber, 134.
Ambergris, 154.
Amethyst, 155.
Amianthus, 156.
Ammonia, 204.
Ammoniac, 237.
Anacardium, 237.
Anaclastic glasses 238.
Analemma, ..
Analysis, ..
Anchor, 239.
Anchovy, 515.
Anchusa, ..
Anemometer, ..
Anemoscope, ..
Angling, 316.
Angular motion, 317.
Anil, ..
Animal substances 317.
Animalcule, ..
Anime, ..
Aninga, ..
Anker, ..
Annealing, ..
Anatto, ..
Antimony, ..

Wax, artificial—method of making, 11
Water-proof Composition, process of making, Fleetwood's Patent, 67.
———— Mills & Co.'s Patent, 299.
Warps, Wells's Patent Apparatus for stiffening silk warps in the loom, 358.
Warming of apartments, Mr. Boyce's Apparatus, 179, 196.
Warming of a Cotton Mill, Mr. Bewley's economical and effectual method, with engraving, 257.
Weighing Machine, Ayliffe's improved with Engravings, 161.
Wheelage, answer to enquiry upon, 159.
Wires, vibration of in the air, 173.
Wire-gauze baskets, covers, &c. Gosset's Patent, with Engraving, 329
Wines, distillation of with milk, 191
Woollen Cloth, Fussel's patent method for giving a lustre to, 202.
Wood Embossing, Straker's method, 252.
——— mode of casting ornamental articles in, 173.
Worms, sea, 143.

ERRATA.

Page 4, line 33, for io, read *to.*
8, —— 13, — publicatoin, read *publication.*
17, contents, — manufacturing in, read *in manufacturing.*
25, line 12, — the parts, read *these* parts.
42, —— 32. — cohebation, read *cohobation.*
43, —— 29, — Paraceleus, read *Paracelcus.*
63, —— 36, — of spirit, read *or spirit.*
73, —— 13, — shot, read *short.*
98, —— 26, — and the turncocks, read *or the* turncocks.
166, —— 41, — for the sale, read *the sale.*
178, —— 1, — Mr. Curdy, read *M'Curdy.*
205, —— 8, after the word *vessels* should be a full stop.
236, note at bottom of page, for to our present, read only *our present.*
253, line 34, for identified, read *identical.*
—— —— 35, — is connected, read *as connected.*
270, —— 43, — scan, read *ensure.*
284, —— 7, — much less, read *except.*
285, —— 5, — emoluments, read *emolument.*
287, —— 37, — now, read *not.*
294, —— 10, — justifies in, read justifies *us* in.
315, —— 35, read " strength and velocity" *of the wind.*

REGISTER

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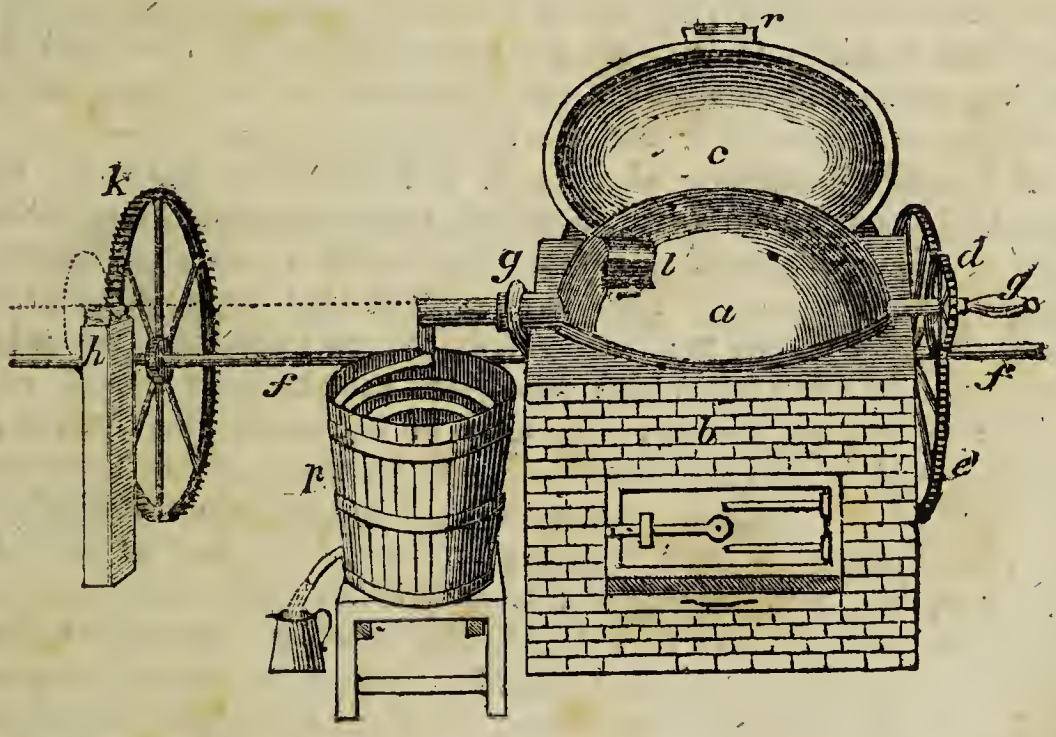
CONTENTS:

Inventions Discoveries and Processes.

Evans's Coffee Roasting Machine 1
Further information on Brown's Vacuum Engine 3
Patent Improvement in Carding Machines 6
Method of working a Ship's Pumps by means of the Capstan 8
Patent process of making Sheep skin Rugs..... 9
New Steam Sugar Boiler 10
Artificial Wax..... 11
The New Parachute..... *ib.*
Elements of Natural Philosophy

Miscellaneous Articles.

No. 16 12
Scientific and Miscellaneous Intelligence 14
Paragrandine..... *ib.*
Preparation of Horn ..... *ib.*
Honey Vinegar ..... *ib.*
Power Looms 15
Silvering Copper ..... *ib.*
Fusible Metal ..... *ib.*
Mercury ..... *ib.*
Caoutchouc or Indian Rubber.. *ib.*
Light ..... *ib.*
Premiums and Patents 16
Correspondence..... *ib.*



MR. EVANS'S PATENT APPARATUS FOR ROASTING COFFEE, AND OTHER PURPOSES.

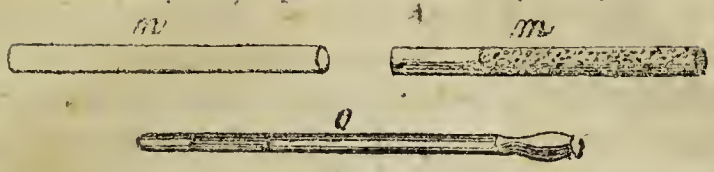
IT affords us pleasure to have the power of laying before our Readers an account of the Patent Apparatus by which Mr. Evans so skilfully conducts the operation of Roasting Coffee. By his process, our West India Plantation Coffee is so much altered in its constituent principles as to approximate to the flavour and fragrance of the Mocha.

The art seems mainly to consist in the abstraction of the aqueous and acidulous particles, without volatilizing the essential oil; upon which chiefly depend its flavour and agreeable qualities. The patent process is attended with this further advantage, that from a given weight of raw coffee a greater weight of roasted coffee is obtained than by the old or common process, in a great measure owing to the retention of the essential oil: it follows therefore that a smaller quantity than usual of the patent Coffee suffices to make a good and palateable infusion.

Description.—*a* is an elliptical iron retort revolving upon axles; the mouth or vent of the retort forming one axle, the other is likewise made hollow, for the convenience of introducing an instrument called the examiner (which will be hereafter described). *b*, is a furnace or stove for the fire, with an air aperture, and ash pan beneath the door; a frame of iron is sunk into the upper part of the furnace so as to form a receptacle of the exact figure of the retort, to receive that portion which is below the plane of its axis, such part being exposed during its operation on the furnace to the action of the fire. *c* is an elliptical cover to the retort made to fit accurately, and to come over the elliptical rim of the iron frame before mentioned; the object of this cover is to prevent the cooling effects of the air upon the retort, and it serves also to confine one of the axles preventing it from being lifted out of its bearing. It is obvious that a crank handle might be employed in various ways to give a rotatory motion to the retort, but the patentee, with a view to more extended operations, has made some very ingenious and economical arrangements for conducting his business upon a larger scale, which we shall now describe:—

A small cog wheel or pinion, *d*, is fixed on to the axle, and is moved by a large cog wheel, *e*, which revolves upon the main shaft, *f f*, and this is supposed to communicate with a steam engine, water wheel, or other power. Now it is evident that any number of these retorts may be placed in a line, and be moved by similar means to the one shewn in the engraving; likewise, that another line of retorts may be placed on the opposite side of the main shaft, with their pinions working into the same large cog wheels. When the material contained in a retort has been operated upon sufficiently by the fire, the retort is lifted by its axle from its present bearing, at *d*, by hand or by a pulley, and turned over so that it shall fall into the opposite bearing made to receive it at *h*; the cog wheel *d* thus comes into the situation shewn by the dotted line, and motion is instantly communicated to it by the large cog wheel, *k*, which constantly revolves on the shaft, *f f*: in order to accommodate this action of turning over, the bearing at *g* is formed of a swivel ring, and the axle passes through that ring, so that the ring turns round with the axle, and forms an efficient and uniform bearing, whether the retort is on the right or left of it.

l is a door in the retort for the purpose of charging it with the coffee or other material to be operated upon, and is made to shut close and latch fast.



m is a tube of copper, stopped up at one end and perforated with very numerous small holes, this tube is made to fit into the neck of the retort at *g*, with the perforated part projecting into the middle of the body of it. *n*, is another tube without holes, open at both ends, which is made to fit closely and slide into *m*, like the tube of a telescope; by these means the perforations in the tube *m* may be wholly or partially closed, and the vent being thus regulated to the greatest nicety by the operator constitutes an important part of the process. *o* is an instrument called the *examiner*, which serves the double purpose of prover and safety valve, for being inserted into the hollow cylindrical axle, and through the centre of the pinion, *d*, it passes into the retort, from whence it would be gradually thrust out if the pressure should become too great: the examiner is provided with a scoop or receptacle in one part of it for extracting a sample of the coffee or other material under operation, so that it may be inspected at any time, and without withdrawing it entirely.

p is a tub and worm, or refrigeratory, to be used as occasion may require for obtaining the separate products of substances exposed to the operation of distillation.

MR. BROWN'S VACUUM ENGINE.

As frequent enquiries have been made of us relative to the progress Mr. Brown has made in his experiments since we gave the account of his engine, which has excited such intense and general interest; and as explanations have been asked from us on particular points with regard to the power of the engine—the philosophical *cause* of the effects produced—the number of strokes which the engine will make per minute—its estimated economy as compared with steam-engines—and on a few points of minor consideration; we have thought proper, for the satisfaction of our readers, to ask the required explanations from the inventor, whose politeness in affording information, and readiness (or even *anxiety*) to solicit the fullest investigation of the principle and effects of his invention, entitle him to the highest commendation.

In giving our readers the information we have thus acquired, we will first endeavour to explain, more fully than we have done, the *principle* of the invention, not only as being the most interesting part of the enquiry to men of science, but because we perceive that some very erroneous notions have appeared in *one* or *two* publications, which, to say *the least*, have not treated the subject with that liberal feeling which should ever be evinced by the editors of Scientific Journals towards men of genius and talent.

It appears that much incredulity has existed, with regard to the effects produced with Mr. Brown's principle, by the professors of

Chemistry; but, although most men of chemical science, who have seen the engine in operation, *disputed* the principle *before* they were admitted to an inspection, we have not heard that *any one* of them has *left* without being fully *convinced*, and completely satisfied. At this refusal to credit the published statements without having ocular proof, however, we cannot wonder, as a new theory, or a supposed new theory, has certainly been demonstrated by Mr. Brown. It was hitherto supposed, and the results of the numerous attempts to gain power by the *explosion* of hydrogen and atmospheric air have upheld the supposition, that the utmost extent of power which could be gained with caloric, whether by simple heat or flame, would be only that produced by the destruction of the oxygen, or about one-fifth of a vacuum; but the error of that conclusion, arising from the fact that the experiments alluded to have always been made in *close* vessels, into which the *mixture* has been admitted and *exploded*, is manifest to any scientific person of minute observation; as the simple and common experiment of raising water from a plate or dish into a tumbler, by the application of a lighted paper, will amply testify; it being perfectly clear that, if the only effect were that produced by the destruction of the oxygen, the tumbler would *not* be *three-fourths* filled with the water raised, the remaining space being at the same time nearly filled with smoke: this very simple operation therefore clearly shews that, by the application of a body of flame within an *open* vessel (immediately afterwards closing it) a vacuum to the extent of five-sixths or seven-eighths may be procured.

The most *scientific* description which we have yet seen is that inserted in the last Monthly Magazine, to which we would refer our readers as a clear, but brief, explanation of the cause and effect of Mr. Brown's principle; but a vast deal more might be said to elucidate it, by some of our eminent professors. As, however, it is our object to make the subject clear to mechanics and all others interested, rather than to enter into a full and scientific illustration, we need only add (to the allusion which we have just made to a very common and often-tried experiment), a simple statement of the view we have formed from a second inspection of the Engine.

A close examination renders it evident that the nitrogen, or azote, is expelled by the action of the flame, *while the cylinder is open*, in a greater or less proportion according to the volume of flame employed: thus a flame which does not reach the sides of the cylinder produces but a moderate vacuum, but one which extends across the whole area, filling up all the space round, effects one nearly perfect, the *oxygen*, however, being partly destroyed and partly condensed *after* the cylinder is *closed*, when the gas is allowed to enter only for an instant of time; thus the vacuum is *completed* just as the flame is *extinguished*, and this is further proved by the mercurial guage, in which the mercury steadily, though rapidly, rises until *that instant*. The whole operation of which we speak is but momentary, but a close observation will shew that we are correct. Our scientific readers will easily perceive the very great difference between this operation, and that *supposed* by those writers who treat the principle as

the old one (so often unsuccessfully tried) of *explosion in a close cylinder, from which the azote cannot by possibility be expelled.* We cannot close this part of the subject without expressing some degree of surprise at the mistakes which have been made and persevered in,* as we do not see any thing in the theory of Mr. Brown's principle which is not clearly explained by the well-known fact of the expansion of the air, when submitted to rarefaction.

Having explained the basis or principle of this invention as far as our limits will admit, we will shortly answer the questions relative to the *power* of the engine, by adverting to the fact of the mercury in the gauge being raised to the height of 24 inches and upwards. *We saw it standing* at 25 inches, but Mr. Brown (modestly, and very properly), will not authorize any one to rate it higher than 22 inches, that being amply sufficient, as affording an available power *superior* to that of the condensing-steam-engine; there being no friction in an engine for raising water, and not more than one pound per square inch in a piston engine of any size. The number of strokes per minute which the former made in our presence was twenty-nine, but a trifling alteration in the *mechanism* will increase the number to thirty-five, or perhaps forty; in fact, the vacuum is so *instantaneously* formed, that any number of strokes which could be wished may be made. When pistons are worked in a separate cylinder, two or three strokes of the piston may be made with each stroke of the vacuum cylinder, i. e. each time the vacuum is affected.

The question of the *economy* of this Engine is easily discussed. Experience must be had in the construction of engines of various powers and forms before any correct estimate can be given of the cost of its erection; but, as far as we can judge, the expence of a Piston Engine cannot in any case equal that of a steam-engine, while the cost of an Engine for raising water will not much exceed *half* that of the other. The money spent in the erection of an engine, however, is of but little comparative importance with the expence of keeping it in active operation when erected, and in the latter respect we have no doubt whatever that the Pneumatic Engine has decidedly the advantage over the steam-engine. The various calculations of the power and cost of steam we need not enumerate, as those of our readers who are interested in the inquiry can doubtless refer to estimates

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* The Editor of an Edinburgh paper has supposed that Mr. Brown admits under the piston, a mixture of common air and gas, the latter being introduced *from time to time;* and at *each injection* of gas the *mixture* is ignited. By this process (he says) the oxygen is burnt out and the elastic fluid in the cylinders *so much diminished.* He then supposes that the cylinders, and the air within it, are cooled down by the external application of water, and that therefore the original quantity of air will be *diminished one third*—the power thus produced, he argues, will "scarcely overcome the friction of the machine." He further assumes that to consume one foot of oxygen, half a foot of coal gas must be used, the combustion yielding one foot of carbonic acid, and thus he says no vacuum will be formed. We quote the above to shew how easily it is to misunderstand *the principle* from mere report; we would therefore seriously advise our cotemporaries to *see* the engine *at work* and judge for themselves before they venture to dispute its merits and novelty or the talents of its Inventor.

as correct as our own; and our comparison cannot be yet made so complete as we could wish, nor quite so favourable for the Inventor as we think it soon will be; for Mr. Brown will not allow us to state the extent of the effect which he is likely at an early period to produce to the satisfaction of the public; but judging from what *we have seen*, we have no hesitation to repeat our confident belief that he will be able to raise *upwards of* 300 *gallons of water, twenty feet high, with each cubic foot of coal gas*, and this fact will amply demonstrate the superior economy of Mr. Brown's Engine in all countries where the residuum, left by the extraction of that gas, is a saleable article. In the iron counties particularly, where the coke is of greater value than the coal from which it is produced, the introduction of this engine, we may fearlessly assert, will prove of incalculable value.

It has been surmised by some, that this inveution will cause a great revolution in the property invested in steam engines, and therefore be productive of great loss to the country; but a little consideration will shew that if all the losses incurred be counterbalanced by the savings of a few years, the *ultimate* gains will prove a great and permanent advantage. Some fears appear to be also entertained by a few Engineers lest their trade should be seriously injured, but in our opinion, as the patentees intend, we learn, to throw the field wide open, and allow all competent engineers to manufacture their engines, the interests of that respectable class will be materially benefitted, rather than injured, by a new and extraordinary demand.

The other advantages of this new, simple, and extraordinary power, which we enumerated in our former description, we need not now repeat; but we may be allowed to express our honest, unbiassed, and impartial conviction, that, although the Steam-Engine may yet be preferred in *some* situations, the Pneumatic or Vacuum Engine will, for *general* purposes, in economy, simplicity, power, safety, and convenience, stand unrivalled in the world.

IMPROVEMENT IN CARDING MACHINES.

Messrs. Crighton, of Manchester, have lately taken out a patent for an improvement in Carding Machines, which although apparently of an inconsiderable nature, we consider it proper not to omit the notice of, as the operation of carding is one of the greatest importance in all our manufactures of cotton, flax, silk, and wool.

In the machines employed for this purpose the cotton, wool, &c. is exposed to the action or combing, of an immense number of loose teeth made of wire and bent into an angular form which are stuck upon leather *cards* in the manner of a brush; these cards of wire teeth, are fixed upon cylinders which act against each other, and the cotton, &c. being introduced between them, are combed or carded by the teeth, until almost every individual fibre is separated and drawn out straight, and every little knotty and entangled part disengaged, by being gradually passed through the machines. The cotton, &c. is subsequently prepared in various ways by other machinery, according to the several purposes for which is destined.

Formerly the cards were fastened upon *wooden* cylinders by means of nails, but great inconvenience was found by the expansion and contraction of the wood in changes of the weather, which destroying the true circular figure of the cylinders rendered their operation very defective. Of late years "*composition*" cylinders have been substituted, with the view of remedying the inconvenience to which the wood were liable. These are made by covering a cylinder of sheet iron with a thick coating of the *composition,* which is a mixture of whitening, glue, water, whitelead and linseed oil, and is laid on with a hard brush in the state of a thick paint; when a sufficient thickness has been obtained by successive coatings, it is left to become quite dry and hard, and then turned to a true cylindrical and smooth surface. Upon this composition surface, the leathers of the cards are fastened by means of screws, which pass through the composition and the iron plate. Cylinders of this kind are subject to the inconvenience of having the screws become loose. Messrs. Crighton's Patent consists in an improvement of these composition cylinders, which we shall now endeavour to describe without the aid of the drawings attached to the specification.

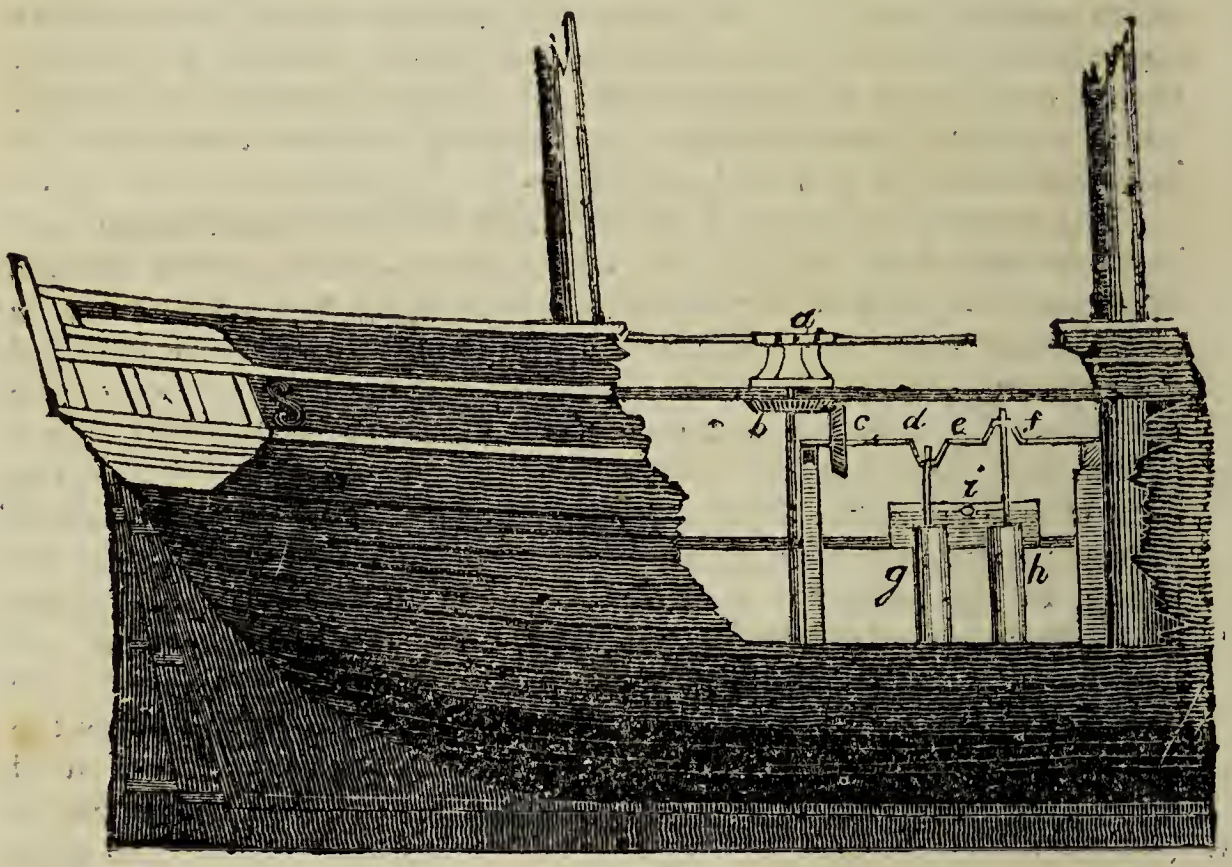
The carcass or frame of the cylinder is composed of three cast iron wheels, placed equidistant upon a shaft which passes through their centres; the two outermost wheels have projecting rings or edges, and upon the periphery of these several wheels is fitted a cylinder of sheet iron, which is rivetted to the rings or edges just mentioned. Upon the surface of this cylinder of sheet iron, are a number of long and shallow cast iron boxes, cast with a curve to fit the form of the cylinder; these are placed longitudinally, and at a small distance apart from each other, leaving channels or grooves between them; in this situation they are fastened to the cylinder of sheet iron by means of screw-bolts. Into the channels or groves just mentioned are fitted and secured long slips of wood. The cylinder is first painted with common oil paint; next to which it receives the first coat of composition, which is laid on with a hard brush in all those spaces intermediate with the slips of wood;—coat after coat is laid on till the surface of the composition is raised higher than that of the wooden slips, when it is subjected to a turning to reduce the whole to one true cylindrical and smooth surface. Upon the wooden slips, the edges of the leather cards meet and are nailed or tacked thereupon, and thus the combined advantages of wood and composition are obtained in one cylinder, wood being the best and most convenient substance for fastening the edges of the cards upon, and its expansion or contraction can no longer affect the work going forward, as that part of the card which contains the wire teeth rest upon the unalterable and true composition surface. The wooden slips being so placed can at any time be taken out and renewed by the substitution of fresh pieces.

NEW MODE OF WORKING A SHIP'S PUMPS.

" *To the Editor of the Register of the Arts and Sciences, &c.*

" Sir,

" To lessen the dreadful and not unfrequent calamity of shipwreck, owing to the inadequacy of the pumps, or the exhaustion of the men in working them, when sprung-a-leak at sea, is my object in submitting to your consideration a plan, by which (as it appears to me) a much larger quantity of water might be discharged from the ship's hold, with greater rapidity and infinitely less labour, than by the ordinary mode; and should you, Mr. Editor, be of opinion that it is practically advantageous, I shall be obliged by your laying it before the public through the medium of your useful publicatoin.



VIEW OF A PART OF THE HULL OF A SHIP,

EXHIBITING MR. JOHN BLYTH'S PLAN FOR WORKING A SHIP'S PUMP BY MEANS OF THE CAPSTAN.

" *Reference to Engraving* :—A represents the capstan, which is generally used on board ships; and, with a trifling alteration, the machinery can be attached to capstans now in use, in the following manner. Immediately under the upper deck, at B, a bevel wheel is fixed on the axis of the capstan, the revolution of which gives motion to the pinion C, and the horizontal shaft and cranks D, E, F, which in their ascent and descent work the pistons or plungers in each pump, at G H.

" When the pumps are not required to be worked, the pinion C *is thrown out of gear by means of a clutch box, and the capstan is used alone* for the ordinary purposes of the ship.

"It will be perceived that I have placed the pumps fore and aft, instead of athwart ships, as usual; this would, however, be no disadvantage whatever, as the suction pipe of the two pumps could be easily curved or split, so as to drain both sides of the keelson.

"The capstan is supposed to be three feet diameter, and the handspikes by which it is set in motion are six feet long, six inches of which is buried in the head of the capstan, consequently the radius described by the handspikes is seven feet, the diameter of which is fourteen feet, and the circumference nearly forty-four feet. Now, supposing a man to walk about three miles an hour he will pass over two hundred and sixty-four feet in one minute, or make six revolutions of the capstan and the bevil wheel B in that time: the pinion C (drawn out of due proportion in the engraving) is only one-fifth the diameter of the wheel B, and will consequently make thirty revolutions in a minute, which, by exertion, when the occasion requires, may be increased to sixty, or in other words, double the quantity of water may be raised within the same time.

"The pumps are supposed to be eight inches diameter, and a twelve-inch stroke, which, with thirty strokes per minute, would raise upwards of 128 gallons per minute, or 7,700 gallons per hour.

"As almost any requisite degree of power may be applied by a ship's crew to the capstan, pumps of much larger dimensions may be employed for draining ships than those generally used, and the advantage resulting would be in proportion.

"I am, Sir, Yours, &c.

"44, *St. John-street, Smithfield,* "JOHN BLYTH."

"*August* 11*th*, 1824.

THE PATENT PROCESS FOR PREPARING SHEEP AND LAMB SKINS WITH THE WOOL ON FOR RUGS.

The following process for making the article above-mentioned is that adopted by Mr. Richard Gill, of Barrowdown, Rutland, Fellmonger, and is secured to him exclusively by a Patent, dated July 24, 1823.

The skins with the wool on are thoroughly cleansed from all impurities and foreign matter that may adhere to them by washing in running water, and by scraping the flesh side in the usual manner by the knife. The skins are then rounded, as it is termed, by cutting off all the extraneous and ragged parts, when they are ready to be tanned; the skins are for that purpose stretched upon frames, and laid upon trussels with the flesh side of the skin upwards: an infusion of sumach in the proportion of one pound to a gallon of water is then poured over the skin, and the tanning matter is well worked into the pores of the skin by the aid of the knife. When dry, the reverse, or wool side of the skin, is next placed upwards and thoroughly washed with a strong alkaline soap and water, and afterwards in fair water, by which means the grease and filth are removed; when this is dry, the skin undergoes a second operation of tanning with the

sumach as before mentioned, and after being dried, its harsh and rigid surface is rendered smooth and soft by rubbing it over with pumice stone. In order to dye it of any colour, before it is taken off the frame, its face or woolly part is dipped into a bath of the required tint, prepared in the ordinary manner for dying wool; the washing must now again be repeated to get rid of the excess of colouring matter which adheres to it. The skins being then dried and trimmed to the proper shape are considered complete rugs, and are ready for sale.

NEW STEAM SUGAR-BOILER.

An experiment was made, in the presence of several gentlemen connected with the West India Colonies, on Mr. Smith's Patent Boiler, which has been employed so successfully in Lancashire in the manufacture of salt, in reducing a solution of sugar of the same strength as the juice of the sugar cane, to a consistency sufficiently concentrated to form sugar. The principle of the boiler is, that of giving any required degree of graduated heat by means of compressed steam, which has the advantage of never burning any material submitted to its action, and which has long been a desideratum in the arts. It was feared that from the high temperature required, for the purpose of crystalizing sugar, this boiler could not be applied to that object, but the result of the experiment has been most triumphant in its favour. The experiments were as follows:—

A fire was lighted under the receiving boiler, with cold water in the lower boiler. The furnace drew well, and in nine minutes the water boiled rapidly.

In the second experiment the fire was lighted, and the boiler filled to one third of its contents with water, when one pound of sugar in proportion to each gallon of water was added. The whole boiled briskly in ten minutes, and in fifty-eight minutes from the time the fire was lighted, the sugar was so much concentrated as to crystallize easily.

Some part of the sugar was left in the bottom of the pan, which crystallized without any degree of carbonization, though a heat of 244 degrees was applied; and during the whole process there was none of that empyreumatic odour which uniformly accompanies the boiling of sugar in an ordinary cauldron.

From the result of these experiments it is confidently expected that a great improvement has been discovered in sugar boiling. Molasses, which is an uniform product of the ordinary mode of concentrating the cane juice, is supposed to arise from a carbonization of the saccharine matter during the process of boiling. Should this be the case, a saving of 33 per cent. will take place in the boiling of sugar, and an article will be produced so superior to that which comes to this country under the name of Muscovado sugars, that it will be unnecessary to make it undergo an additional process of refining at home. During the whole process the steam employed

as the boiling medium, was never compressed above fourteen pounds to the square inch, or about the pressure of one additional atmosphere.—*British Press.*

ARTIFICIAL WAX.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I BELIEVE it is pretty well ascertained, that oil may be consolidated so as to resemble wax, and may then be used for all the purposes to which that substance is applied. Father Jeronimo, who had a literary contest with Lily the astrologer, notes at some length in the 'Secrets of Nature Displayed,' the process of converting oils into wax. Butcher, of Romford, in 1804, pretended that he knew how to consolidate linseed oil; one of his ingredients was *rennet*. A magistrate residing near Waltham Abbey, in 1808 communicated to Don Pedro Schropp, who came to England to purchase cavalry accoutrements for the Spanish Patriots, the art of making Wax from olive oil. Mr. Mitherie made Artificial Wax by mixing nitrous acid with olive oil, so as not to be distinguished from real wax.

"It is obvious that the grand desideratum is, the production of wax from the cheaper (vegetable) oils, such as linseed, which process some of your scientific readers may be able to explain.

"I am, Sir, your's, &c.

"15, *Duke Street, Westminster,* "W. H. PITCHER."

"*26th Aug.* 1825.

NEW PARACHUTE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IN reply to the letter in your last number* signed E. W. denying the originality of my communication inserted in your 20th, I hope you will permit me to state that I had neither seen nor heard of the letter which that gentleman inserted in the Mechanic's Magazine when I sent my communication to you; nor had I the least idea that such a plan had been proposed before, or I do assure you, I would neither have attempted to fill your valuable pages with *second-hand* matter, nor to disgrace myself by assuming that as my own which proceeded from another source. I have, however, since the publication of your last, consulted the letter to which he refers, and finding the plan there proposed so very similar to my own, and as the 41st number of that work was published earlier than the date of my letter, I, of course, resign the honour of the improvement to E. W.

* We much regretted the necessity we felt ourselves under of inserting the letter signed E. W. in our number 23, of which this gentleman so justly complains—and we are fully persuaded of the injustice of the attack.—ED.

"I am sorry I have no direct method of proving that E. W.'s accusation against me, of sending a disguised copy of his letter to you, is altogether unjust, and that I had not seen his letter when I sent my communication; if, however, Sir, you will compare the two letters, you will, I dare say, perceive, that one has not been borrowed from the other.

"But I am intruding on the plan of your work; the improvement I give up to E. W.; but at the same time beg leave to assure both you and him, that my letter was not pirated, but altogether an idea of my own.—By an early insertion of this you will much oblige, "Your's, respectfully,

"W. L—y."

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 16.—Optics.

Of the different refrangibility of the Rays of Light.

(Continued from Vol. I. page 334.)

It was the opinion of philosophers before the time of Sir Isaac Newton, that all light in passing out of one medium into another, of different density, is equally refracted in the same or like circumstances: but that indefatigable investigator discovered that light is not a simple homogenous body, but that it is compounded of different species; and that each species is disposed both to suffer a different degree of refrangibility, in passing out of one medium into another, and to excite in our mind the idea of a different colour from the rest: and that bodies appear of that colour which arises from the composition of the colours, the several species they reflect are disposed to excite.

To shew this let a room be darkened, and the sun permitted to shine into it through a small hole in the window-shutter, and be made to fall upon a glass prism: then will the sun's rays, in passing through it, suffer different degrees of refraction, and by that means be parted into different rays, which being received upon a sheet of white paper, will exhibit the following colours, viz. red, orange, yellow, green, blue, indigo, and violet; and if the whole spectrum, or image, be divided into 360 equal parts, the red will occupy forty-five of them, the orange twenty-seven, the yellow forty-eight, the green sixty, the blue sixty, the indigo forty, and the violet eighty.

As a ray of the sun may be separated into these seven primitive colours, so by their mixture in the due proportions, may white be produced. White therefore is the mixture of all the colours, as black is the want, or deprivation of colour: and this may be proved, by fixing pieces of cloth of all the seven different colours on the rim of a wheel, which by whirling it round with great velocity will appear to be white. Though seven different colours are distinguishable in the primitve spectrum, yet upon examining the matter with more accuracy, it will be seen that there are, in fact, only three original colours, *red, blue,* and *yellow*; for the orange being situated between

the red and yellow, is only the mixture of these two; the green in like manner arises from the blue and yellow, and the violet from the blue and red.

The instance of the separation of the primary colours of light which seems most remarkable is that of the rainbow. It is formed by the reflection of the rays of the sun's light from the drops of falling rain, though frequently it appears among the waves of the sea, whose heads or tops are blown by the wind into small drops, and it is sometimes seen on the ground when the sun shines on a very thick dew.

Cascades and fountains, whose waters are in their fall divided into drops exhibit rainbows to a spectator, if properly situated during the time of the sun's shining; and water blown violently from the mouth of an observer whose back is turned towards the sun, never fails to produce the same phenomenon.

The appearance is also seen by moonlight, though seldom vivid enough to render the colours distinguishable; and the artificial rainbow may be produced even by candlelight on the water which is ejected by a small fountain or *jet d'eau*. All these are of the same nature and dependent on the same causes, viz. the various refrangibility of the rays of light.

The colours observable on soap bubbles, and the halos which sometimes surround the moon are also referable to the same origin.

Of the Eye.

In order to understand the science of vision, it is necessary, first to describe the organ of sight.

The eye is placed in a bony cavity, called the orbit, which is lined with fat to form a soft bed for it to rest upon, and facilitates its various movements. It is defended by the brows from the light when it is too strong, which also serve to prevent it being incommoded by any substance which might slide down the forehead, and thence fall into the eye.

The eye-lids, like two substantial curtains, protect and cover the eyes when we are asleep; when we are awake, they diffuse by their motion, and by peculiar secreting organs, a fluid over the eye, which cleans and polishes it, and thus renders it fitter for transmitting the rays of light.

That the eye-lids may shut with greater exactness, and not fall into wrinkles when they are elevated or depressed, each edge is stiffened by a cartilaginous or gristly arch. The eye-lashes, proceeding from these cartilaginous edges, warn the eye of danger and protect it from the sudden contact of accidental substances.

The eye itself is of a globular form, but more protuberant on the fore-part than behind, and is composed of three coats, or teguments one covering the other, and enclosing three different substances, called humours.

[*To be continued.*]

SCIENTIFIC AND MISCELLANEOUS INTELLIGENCE.

Paragrandine.—A new invention, called the Paragrandine, is spoken of in some of the Italian journals. Its object is to avert *hail-storms*, as the electrical conductors serve to obviate danger from lightning.—In this climate, the hail is seldom so violent as to occasion any very serious losses: but in many parts of the continent, it is dreaded as the most destructive enemy of the husbandman; and we have known insurance companies established for the sole purpose of guarding against loss by hail-storms. The inventor of the Paragrandine is a Signor Apostolla. One of the latest accounts of its beneficial effects (published by Signior Antonio Perotti of San Giovanni di Cassara) states, that having on a piece of land belonging to himself containing 16,000 perches in extent, fixed up several of the Paragrandini, he had the satisfaction to find that no injury was done by hail to the corn, and very little to the vines, although no less than fourteen storms had occurred in the current year, five of which appeared to threaten great mischief to his fields, but passed over them and fell on the neighbouring lands of Valvasoni Baguarola and Savorganno. These instruments are composed of metallic points and straw ropes, bound together with hempen or flaxen threads. Dr. Astolfi, in a letter to professor Francesco Orioli of Bologna, relates that on the 19th of June a hail-storm proceeding in a direction from Bentivoglio to S. Giovanni Triano, came near the lands of Count Chenef, which were protected by Paragrandini; on approaching which the clouds were seen at once to disperse. A notice contained in an official report to the Milan government by the Gonfalonieve of San Pietro in Casale, states that during a stormy day, when there were many claps of thunder and flashes of lightning, he went out to observe the effects of the Paragrandine, and noticed the electric fluid to be attracted by the points of the straw in the machine, around which the flame played in graceful curves; while in the adjoining fields not protected by the Paragrandine, much rain fell and the lightning did considerable mischief.

Preparation of Horn.—The Horn is first roasted over a fire made of the stalks of furze. When rendered soft, it is slit on one side and kept expanded flat between a pair of tongs; it is then placed in a press between iron plates which are greased. The horns are suffered to remain till they are cooled; they are then soaked in water till soft enough to be pared down to the required thinness, with a large knife worked horizontally on a block. Their transparency is thus acquired; and after being immersed in ley, they are polished with whitening and the coal of burnt willow.

Honey Vinegar.—Dissolve in three or four quarts of water a pound of honey, then expose the mixture to a temperature between the seventieth and eightieth degrees of Fahrenheit's thermometer, it will in a short time possess an aromatic flavour, agreeable acid with strength superior to that of the best white wine vinegar, which

is much more expensive, and frequently adulterated with acids pernicious to the stomach.

Power Looms.—The number of Power Looms in the manufacturing district which surrounds Manchester has been, after careful inquiry, stated to be 30,000.

The quantity of cotton converted into yarn in Great Britain and Ireland in one year is about.....	160,000,000lbs.
The loss in spinning may be estimated at 1½ on per lb.	15,000,000lbs.
Quantity of yarn produced.....	145,000,000lbs.
Amount, supposing 1s. 8d. to be the average price per lb.	£10,875,000

According to Mr. Kennedy's calculation, that every person employed in spinning produces 900lbs. per annum, the number of persons employed is 161,111. The number of spindles employed, supposing each to produce 15lbs. weight per annum, is 9,666,666. The capital invested in buildings and machinery cannot be less than £10,000,100. It is calculated that the rental of Manchester, including Salford, Chorlton, Rew, &c. which form part of the same town, will be increased at least £15,000 this year by new buildings. The increase is chiefly in cottage property, under £12 a year rent.

Silvering Copper.—Copper may be silvered over by rubbing it with the following powder. Two drachms of tartar, two drachms of common salt, and half a drachm of alum are mixed with fifteen or twenty grains of silver precipitated from nitric acid by copper: The surface of the copper becomes white when rubbed with this powder, which may afterwards be brushed off and polished with leather.

Fusible Metal.—Is a combination of three parts of lead with two of tin and five of bismuth, it melts at 197 Far.

Mercury.—This metal is distinguished from all others by its extreme fusibility, which is so great that it does not take the solid state until cooled to the 39th degree below O, or Fahrenheits thermometer, and it is of course always fluid in temperate climates.

Caoutchouc.—This substance, which has been improperly termed elastic gum, and vulgarly, from its common application to rub out pencil marks on paper, Indian rubber, is obtained from the milky juice of different plants in hot countries. The chief of these are the jatropha elastica and urceola elastica.

The juice is applied in successive coatings on a mould of clay, and dried by the fire or in the sun ; and when of a sufficient thickness the mould is crushed, and the pieces shaken out. Acids separate the caoutchouc from the thinner part of the juice at once by coagulating it. The juice of old plants yields nearly two thirds of its weight ; that of younger plants less. Its colour when fresh, is yellowish-white, but it grows darker by exposure to the air.

Light.—Some Philosophers regard light as consisting of particles of inconceivable minuteness emitted in succession by luminous bodies which move in straight lines at the rate of 200, 000 miles per second!!

It has been asserted by Count Rumford that the quantity of light emitted by a given portion of inflammable matter in combustion, is proportional in some high ratio to the elevation of temperature; and that a lamp having many wicks very near each other so as mutually to increase their heat, burns with infinitely more brilliancy than the Argand's lamps in common use.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

PRESERVING SEEDS OF VEGETABLES.—For the best method of preserving seeds of plants in a state fit for vegetation, a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the last Tuesday in December, 1824.—The Gold Medal, or Thirty Guineas.

THREAD FOR LACE.—To the person who shall invent and discover to the Society a method of manufacturing thread from flax, of as fine quality as any used on the Continent.—The Gold Medal, or Thirty Guineas.

PREVENTING ACCIDENTS FROM HORSES FALLING WITH TWO-WHEELED CARRIAGES.—To the person who shall invent and produce to the Society a method superior to any hitherto known or in use, of preventing accidents from the falling of horses with two-wheeled carriages, especially on steep declivities. The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

To WILLIAM WHEATSTONE, of Jermyn-street, Middlesex, music-seller; for a method for improving and augmenting the tones of piano-fortes, organs, and euphonons.—Dated, July 29, 1824.

To JOHN FUSSELL, of Mills, Somersetshire, edge-tool maker; for an improved method of heating woollen cloth, for the purpose of giving it a lustre in dressing.—Dated, August 11, 1824.

To HERMAN SCHRODER, of Hackney, Middlesex, broker; for a new filter.—Dated, August 11, 1824.

To GEORGE GRAYDON, of the city of Bath, esq. a captain in the Royal Engineers; for a new compass for navigation, and other purposes.—Dated, August 5, 1824.

TO OUR READERS AND CORRESPONDENTS.

We have received very many Communications upon the subject of Mr. Walpole St. Croix's "Manner of Working the Guns of a Ship," all tending to shew the impracticability of the plan which that gentleman proposed. We wish especially to notice the Letters of "Jack Marline Spike," "Nimrod Sclopetarius," and "Jack," whose remarks are valuable and intelligent. It was certainly our intention to have given free scope for discussion, but as we have received from Mr. St. Croix a polite note, acknowledging his conviction that his projected improvements are in the present stage indigested, we think it but due to that gentleman's candour to suppress the attacks which have been so ably made upon it.

Z. R.—A Constant Reader.—I. C. S.—W. W.—A. B. have been received.

A. X. is informed that the information he requires will be found in page 254 of the Register.

The First Volume of this Work is now complete, with a copious Index, price 6s. 6d. in boards.

[*To be continued every* FORTNIGHT.]

Printed for and published by GEORGE HEBERT, 88, Cheapside; to whom all Communications (post paid) for the EDITOR are to be addressed—and Sold by SHERWOOD, JONES and Co., Paternoster Row; SIMPKIN & MARSHALL, Stationers' Hall Court; and may be had of all Booksellers in Town and Country.

Printed by T. H. Coe, Little Carter Lane, St. Paul's.

REGISTER

OF

THE ARTS AND SCIENCES.

No. 26.] SATURDAY, OCTOBER 2, 1824. [Price 3*d.*

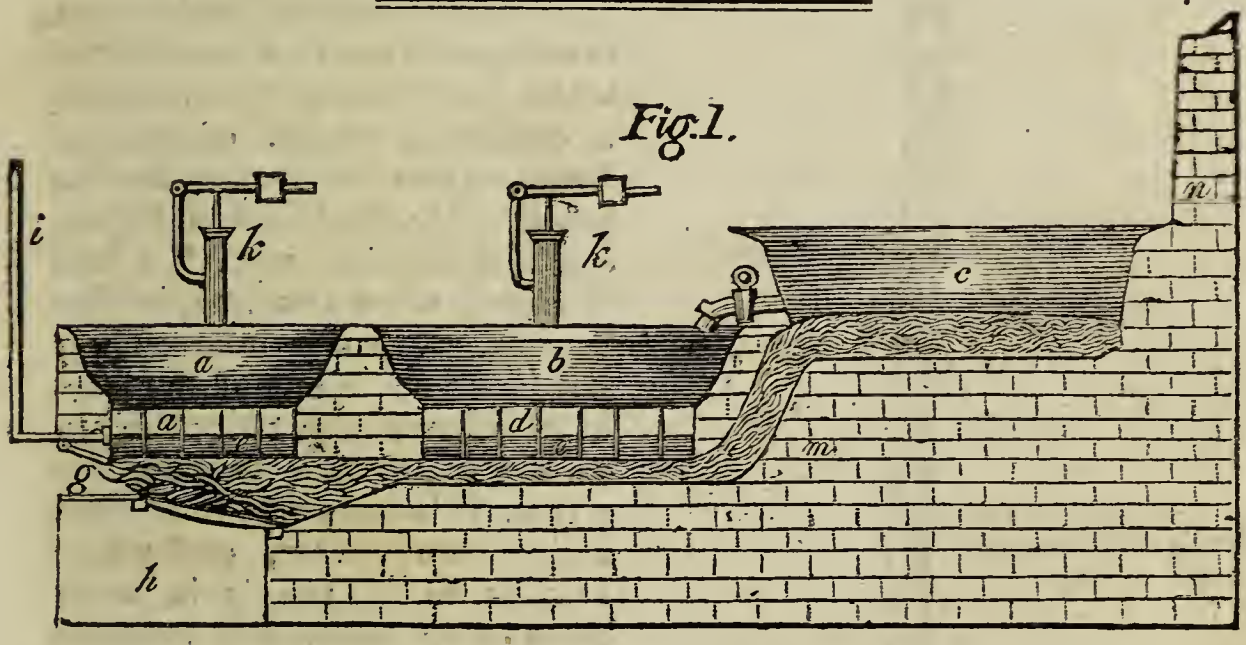
CONTENTS:

Inventions Discoveries and Processes.

Smith's Patent Sugar Boilers .. 17
Cultivation of the Sugar Cane.. 18
Sugar Crushing Mill 19
Process manufacturing in Muscovado, &c. 20, 21
The new Gas Engine Coach 22
Foot's Patent Umbrella Covers 23
French Patent Inventions ..... *ib.*
Carey's Gun and Mortar Boat . 24
Clint's Invention of Sailing Boats 25
Scheffer's Life Preservers..... 26
White's Floating Breakwater .. 27
Account of the Lava thrown out by burning Mountains 27
Elements of Natural Philosophy No. 17 ..... 28, 29, 30
Magnetism ..... *ib.*

Miscellaneous,—Colouring of Glass,—Steel,—Action of Ammonia on Metallic Copper,—Perpetual Motion,—Perspired Vapour,—Ignis Fatuus, ... 31
Premiums and Patents 32
Correspondence..... ..... *ib*

Fig. 1.



SMITH'S PATENT SUGAR-BOILING APPARATUS.

In our last number we gave an account of some successful experiments that were made with the above-mentioned apparatus, and as a great degree of interest is excited by every improvement which concerns so extensive a branch of our manufacture, we have been induced to have a drawing of the invention engraved, and to prefix it as a frontispiece to our present Number:—but, before we proceed to a description of its construction and its mode of operation, we have thought it would be in better order, and more agreeable to a portion of our readers, to give a brief account of the processes previous to that of *boiling* the sugar, and the manner of cultivating the beautiful and valuable plant from which it is obtained.

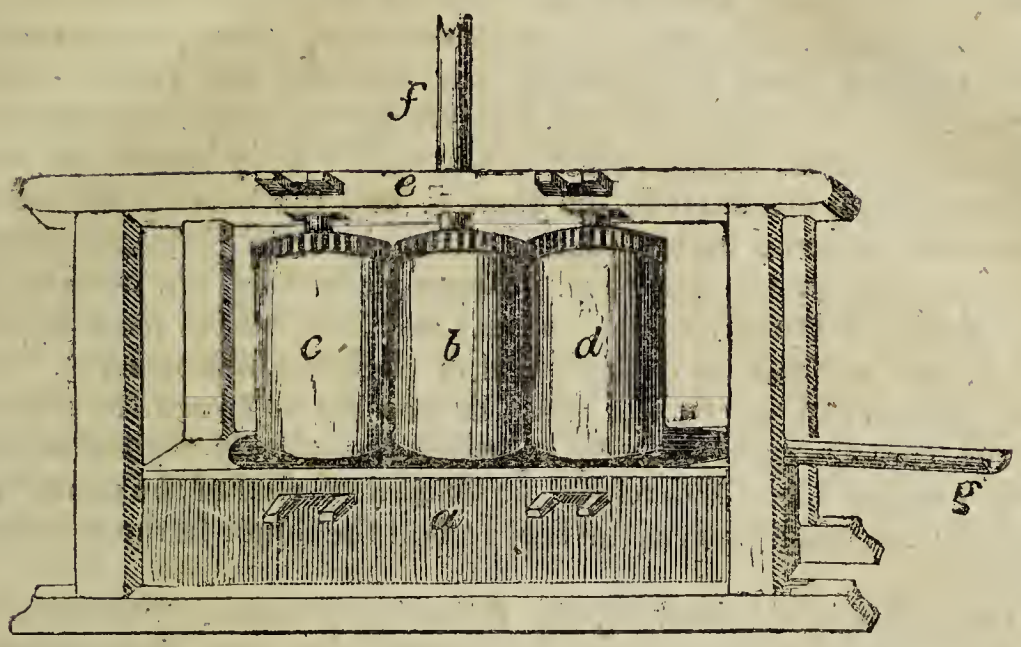
With that view we *first* present them with an engraving of the *Saccharum Officinarum*, or Sugar-cane, in full blossom; and *second*, an engraving of a Sugar-mill, for expressing the juice of the canes.

The Sugar-cane, or *Saccharum Officinarum*, of botanists, is a jointed reed, usually measuring, without the flag-part, from 3½ feet to 7 feet in height, but sometimes rising to 12 feet. When ripe it is of a fine yellow colour; the edges of the leaves or blades are finely serrated, from the middle of which shoot up an arrow, decorated with a beautiful panicle. The joints in one stalk are from forty to sixty in number, and from one to three inches apart; and the number of stalks from one root are often very numerous,—in very rich lands they have been known to put forth more than a hundred shoots. The young shoot ascends from the earth like the point of an arrow; the shaft of which soon breaks, and the two first leaves which had been enclosed within a quadruple sheath of seminal leaves, rises to a considerable height. Mr. Beckford, in his account of Jamaica, says, "a field of canes, when standing, in November, when it is in arrow, or full blossom, is one of the most beautiful productions that the pen or the pencil can possibly describe. It is when ripe of a bright and golden yellow, and where obvious to the sun is in many parts very beautifully streaked with red; the top is of a darkish green; but the more dry it becomes, from either an excess of ripeness, or a continuance of drought, of a russet yellow, with long and narrow leaves depending; from the centre of which shoots up an arrow like a silver wand, from two to six feet in height; and from the summits of which grow out a plume of white feathers, which are delicately fringed with a lilac-dye."

When the plants have attained their full growth, which, in the West Indies, is from twelve to fourteen months, the canes are cut short, tied up into bundles, and brought to the crushing mill, of which the annexed cut is a representation of those in common use.*

* Of late years these mills have been much improved upon, although the principle of their construction is the same. In some of them the three cylinders are placed horizontally.

A CRUSHING MILL.



Description.—A large block, *a*, is enclosed by a strong frame of timber; the upper surface of this block is hollowed out into the form of a basin, to receive the juice of the canes, which is expressed by the three vertical cylindrical rollers, *c*, *b*, *d*, whose lower pivots work in sockets which are fixed in the block *a*, and the upper in *e*. The upper and lower sockets, in which the pivots of the middle roller revolve are fixed immoveably; but the sockets of the other two are held between wedges, (as shewn in the engraving) which are put in contrary directions, the small end of one wedge being on the same side as the large end of the other; by which means the rollers may be either set farther from or nearer to each other. When it is required to set the outside rollers nearer to the middle roller, that wedge which is nearest the middle roller is to be driven out, and the other driven in: and the contrary when they are wanted farther asunder. These rollers are usually made of cast iron, having each a cog wheel at the upper end on the same shaft, which causes them all to turn together, when the power of a first mover is applied to the middle roller, by the shaft *f*. Behind the middle roller is a circular or concave piece of iron or wood, (not shewn in the above engraving) which is called the *dumb-returner*, a name obviously given to the circumstance of a man being always employed previous to the invention of this part of the apparatus, to perform the same office. In working the Mill, a man takes a bundle of the canes, and applying them between the first and second rollers, (*c* and *b*) they are drawn in and pressed between them, but instead of proceeding in a right line, the ends of the canes strike against the concave surface of the dumb-returner, which bends them round the middle roller, and causes them to enter between the second and third rollers (*b* and *d*) which are placed somewhat nearer to one another than *c* and *b*, as the canes have already received great compression, and when they are thus returned through to the front, they are received and carried off by another man. The expressed juice runs down the rollers into the

reservoir, and is conveyed by the trough *g* to the boiling-house. It should be observed, that the reservoir on the top of the block *a* is only cut into channels round the outside of the rollers, to prevent the liquor running down and getting out between the wedges before-mentioned. If a sugar mill be worked by the wind, the shaft *f* is connected with the vertical shaft of the mill. If by horses, the levers they work from are fixed to the shaft *f*, and the horse walk is either raised above ground higher than the trough, or the juice is conveyed by a pipe laid under the walk. Sugar-mills that are worked by a water wheel or steam-engine, have a bevilled wheel fixed upon the shaft *f*, and another upon the wheel or engine which turns it. Such is the pressure given to the canes in passing between the rollers of the mill, that they are not only squeezed completely dry but are often reduced to powder. The refuse, or macerated rind of the cane, which is called cane trash, serves for fuel to boil the liquor in the subsequent operations.

The sugar is obtained by the following process: The juice from the mill runs from the receiver to the boiling house, along a wooden gutter lined with lead. In the boiling-house it is received into one of the copper pans or caldrons, called *clarifiers*. Of these there are generally three; and their dimensions are determined by the power of supplying them with liquor. There are water mills that will grind with great facility, sufficient for thirty hogsheads of sugar in a week. Methods of quick boiling cannot be dispensed with on plantations thus fortunately provided; for otherwise the cane liquor would unavoidably become tainted before it could be exposed to the fire. The purest cane juice will not remain twenty minutes in the receiver without fermenting; hence clarifiers are sometimes seen of a thousand gallons each: but on plantations that during crop time make from fifteen to twenty hogsheads a week, three clarifiers of three or four hundred gallons each are sufficient. The liquor, when clarified, may be drawn off at once with pans of this size, and there is leisure to cleanse the vessels every time they are used. Each clarifier is furnished with a syphon, or cock, to draw off the liquor clear and free from the scum which is thrown up during the boiling. In order to assist in the separation of the gum, oil, and other vegetable principles which are intermixed in the expressed juice, and for the purpose of neutralizing the superabundant acid, a quantity of Bristol white lime in powder, or in solution, is stirred into it, and in the proportions and manner of effecting this, according to the state of the liquor, consists one of the principal difficulties in sugar making. In this first process of clarification the liquor is not suffered to boil, but is allowed to do so when drawn off clear into the next pan, which is called the *evaporating copper:* here the ebullition is continued (and the froth and scum removed by skimmers as it rises) until it becomes of such a consistence, as to be reduced in quantity very considerably, so that it may be contained in a much smaller copper, into which it is next ladled. The liquor is now bright, and of the colour of Madeira wine. In this state and of a certain consistency it undergoes a farther evaporation in the vessel called the *teach*, until it is so far condensed

as to be capable of granulating when cool. The next operation is that of *striking*, which consists in ladling the thick liquor into the *cooler*.

The *cooler* (of which there are usually six) is a shallow wooden vessel, about eleven inches deep, seven feet in length, and from five to six feet wide, and is capable of holding a hogshead of sugar. Here the sugar *grains*, as it is called; i. e. it runs into a coarse irregular mass of imperfect crystals, separating itself from the molasses. From the cooler it is taken to the *curing-house*.

The *curing-house* is a large airy building, provided with a capacious molasses cistern, the sides of which are sloped and lined with terras or boards. A frame of massive joist work without boarding is placed over this cistern; and empty hogsheads without headings are ranged on the joists of this frame. Eight or ten holes are bored in the bottoms of these hogsheads, and through each of the holes, the stalk of a plaintain leaf is thrust six or eight inches below the joists, and long enough to stand upright above the top of the hogsheads. Into these hogsheads the mass from the coolers is put, which is called *potting*; and the molasses drains through the spongy stalks of the plaintain leaves, and drops into the cistern beneath; from whence it is occasionally taken for the making of *rum** by distillation. In the space of three weeks the sugar becomes tolerably dry and fair; it is then said to be cured, and the process is finished.

Sugar, thus obtained, is called Muscovado, and is the raw material whence the British sugar-bakers make their loaf or refined lump sugar.

Having now gone through the several processes of sugar making with a brevity suited to our confined limits; there requires but little to add, to shew the superiority of Smith's Patent Sugar-boiling Apparatus over that used in ordinary, which we have just described; the chief defects in which seem to consist, as stated by the patentee, in the frequent burning and continual waste of the pans—the heavy expences of fuel and labour, and in the direct and unequal application of heat to the pans, more particularly the finishing one, by which the crystal and colour of the sugar are generally much injured, and the quantity of molasses greatly increased. That the Patent Steam Apparatus will afford a perfect remedy for the evils or defects just mentioned we have no sort of doubt.

Reference to Engraving.—*a* is the finishing pan or teach, *b* the evaporating copper, *c* the clarifier; this last is gently heated by the flue *f*, from the distant fire: *a* and *b* are heated by the same fire, through the medium of two separate steam boilers, *d d*, and *e e* shews the depth of water they contain: *g* is the fire door, *h* the ash pit, *i* the feed-pipe for supplying water when necessary, one of which is employed to each steam boiler. *k k* are safety valves for regulating the pressure of the steam, *n* the chimney. Cocks are fixed to each of the boilers for drawing off the water and the steam, which cannot

* A particular account of the manner of Distilling Rum is given in the Register of the Arts, Vol. I. p. 164.

be shewn in the sectional view. We shall now conclude, by quoting some of the observations of the patentee on the subject.

"The bottom of the boilers are flat, and the spaces between them and the bottom of the sugar pan forms the boiler, which need not exceed a foot in depth for the largest apparatus. If the pans project beyond the boilers, it will be found advantageous; for the sides being cooler than the other parts, the fluid is prevented from boiling over, and the scum as it forms, is thrown on the sides, and collected with greater facility. The steam being applied to every part of the bottom of the pan, communicates its heat to the liquor therein, and being thereby condensed descends in drops of water to the bottom of the boiler, and is again raised into steam by the heat of the fire underneath, so that the operation continually goes on of generating and condensing in the same vessel, thus dispensing with force-pumps and complicated feed-pipes; however unequally the fire may act on the boiler, the effect on the bottom of the sugar pan is perfectly equalized by the intervening stratum of steam, an advantage peculiar to this apparatus. The steam boiler and sugar pan are made of thin copper, or iron; and to give sufficient strength to large surfaces, they are united by rivetted bolts at short and equal distances, thus enabling thin metal to resist any required pressure of steam."

GAS ENGINE CARRIAGE.

We have taken occasion to speak very highly of Mr. Brown's Gas Vacuum Engine, and are now glad to find that by combining it with Mr. Gordon's Portable Gas Reservoirs, the public are likely soon to be furnished with a loco-motive carriage for general purposes. A company is actually forming, the subscriptions for which, we learn, are nearly full, for the purpose of contracting to run the mail coaches and other carriages, by means of this engine supplied with Portable Gas.

The great weight of steam engines, with the requisite supply of coal and water, has hitherto prevented their successful application to loco-motive carriages. This formidable obstacle is altogether removed by Mr. Brown's invention, as we understand that a six-horse power engine will certainly not weigh ten hundred weight, and the Portable Reservoirs requisite to supply the engine with gas for 1½ hours for one stage of 15 miles, will not weigh one hundred more. It is expected that a carriage will be completely ready to start in four months, when it is intended to be dispatched to York and back at the rate of ten miles per hour, and the expences are estimated at less than *one half the mileage of a four horse post coach.*

This subject has of course, excited no inconsiderable share of public attention, and has not failed to produce rumours of the most extraordinary description. The idea of propelling a carriage *without horses* seems so inconceivably impossible to the minds of the generality of persons, that the plan is of course considered as superlatively ridiculous; many others more profound however imagine that the

theory of the thing is plausible enough, and that it might do for rail roads or any other level surface, but to get up a tall *hill*, this seems to be the mountaneous difficulty, and not less *steep* are their fears touching the running down thereof. The appearance of a huge monster (such as a carriage *without horses* must be), without eyes, or even instinct, and like an avalanche, carrying all before it, must be sufficient to strike dismay in the hearts of the stoutest, and must necessarily be considered as one of those alarming signs of the times which have been indicated by Francis Moore, Esquire, of very sagacious memory. Seriously, however, we are assured that all these obstacles will be most completely and most satisfactorily removed, and we do not for one moment hesitate to believe in its certain practicability and success.

NEW PATENT COVERING TO UMBRELLAS.

Mr. Joseph Foot, silk-manufacturer, of Spitalfields, has recently taken out a patent for a peculiar fabric for the covering of Umbrellas, which is said to be more impervious to the rain, very durable, and less expensive than silk, yet having the appearance of being made of that material, being made "by shooting cotton or linen thread upon a silk warp," in such a manner that the surfaces shew more of the silk than of the cotton or linen.

FRENCH PATENT INVENTIONS.

Among the list of patents granted by the French Government, during the year 1823, we think that the following may afford some useful hints for the exercise of English skill, viz.—

To M. Belargent, No. 64, Rue Popincourt, Paris, for 15 years, for a method of converting or regenerating old plaister into new.

To M. Chevenier, Lyons, for 15 years, for an improved machine for making that particular kind of nails, called Paris-points, which have spear points, and by the use of which 6000 may be made per hour.

To Dubergue and Dubois, Rue Mauconseil, Paris, for 15 years, for the application of two archimedian screws to the sides of boats or ships, which are to be worked by a steam-engine or other power, and by their means cause the vessels to ascend the streams of rapid rivers.

MR. CAREY'S IMPROVED GUN AND MORTAR BOAT.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I SEND you an improved plan of a Gun and Mortar Boat, with sheer bowsprit. I cut a port-hole through, and fit a port, the same as the lower deck port. I have combings and gratings fitted over my gun, which runs in until wanted to the mainmast. Over the gratings I have a tarpauling in bad weather; along-

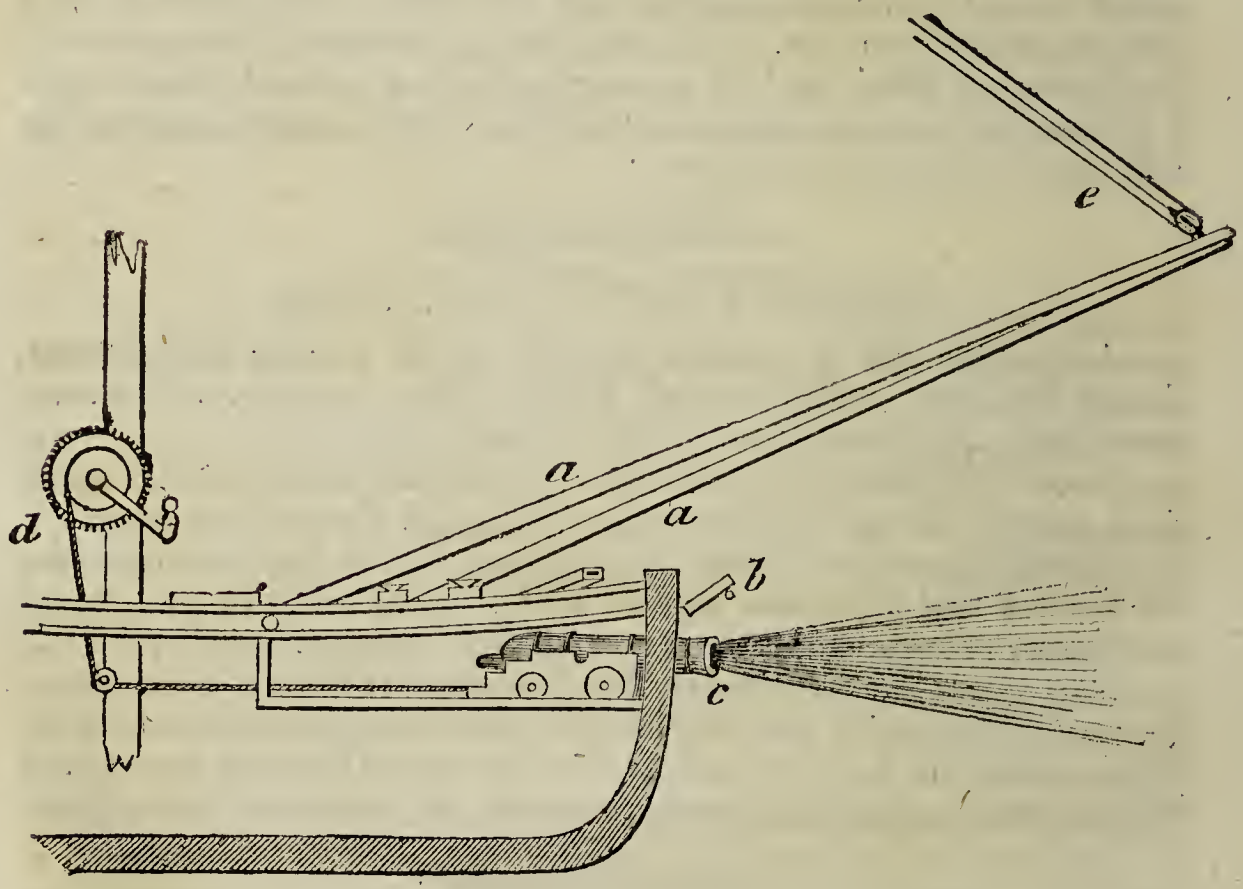
side of my mast I have a winch which runs my gun in and out, and hoist my mainsail and foresail, and also tops my sheer bowsprit up when about to fire the gun. With two men, a boy, and an engineer, with a steam engine on board, and a long 32-pounder with a chamber in the gun, I could destroy a frigate in a calm, or dismast and sink a 74 gun ship. If I have a steam engine on board and she attempted to hoist out their boats to board me, I could run away from them, and if I had a gun fitted right aft could destroy the boats and their crews. The sheer bowsprits show their utility, as no bowsprit shrouds are wanting, nor no bobstay, the gib tack forming the bob-stay.—I fitted a boat in this way when I was at his Majesty's yard at Gibraltar, which Lord Nelson highly approved of.

"If you think this worthy insertion in your useful Magazine, it is at your service.

"Yours, &c.

"EDWARD CAREY,

"*Surveyor of Shipping, Bristol.*"



Description.—*a a* the sheer bowsprit.

b the port and port-hole.

c the 32 long-pounder, with a chamber; in bad weather the gun is run under a grating which is over it upon deck.

d Winch to heave the gun out and in; after firing hoist the main sail and heave up the sheer bowsprit.

e the gib-stay and topping lift to raise the sheers when going to fire.

N.B. A magazine is placed midway between the gun and the ship's side, which cannot be shown in the above view.

MR. CLINT'S* BALLANCED MASTS FOR SAILING VESSELS.

Fig. 1.

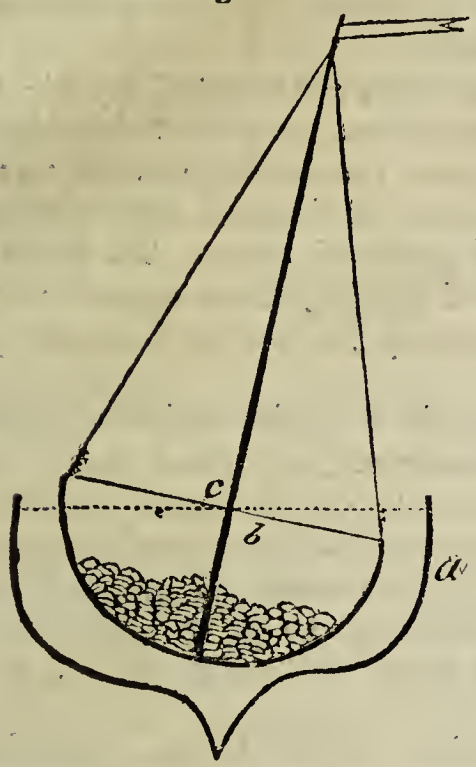
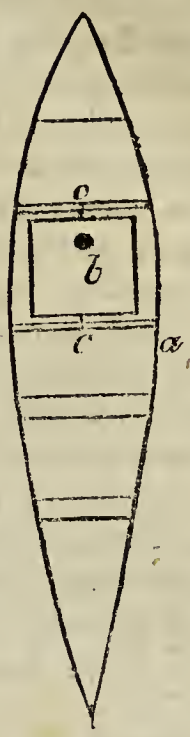


Fig. 2.



The object of this invention is, by having the mast, rigging, &c. placed in a ballasted cassoon or box of a semicircular shape, suspended fore and aft on pins, &c. in two deck beams; that the mast, &c. shall alone be acted on by the wind, and (as shewn by the figure) leave the vessel itself perfectly upright, when close hauled upon a wind.

Explanation of figures in the Plates.—Fig. 1, *a,* a section of the hull of the vessel. *b,* a section of the swinging cassoon, with the stays, pennants, &c. fastened to it, and the box containing the ballast. *c,* the point of suspension on the deck beams. *Fig.* 2 is a plan of the sailing boat, containing the cassoon *b,* and swinging upon the pivots, *c c.* Mechanical skill will be requisite in the construction of the parts for strength, to sustain the ballast: pins of three inches diameter would sustain about thirty or forty tons. The forestay is to be hooked to the stern head.

The advantages proposed by Mr. Clint, by this construction, are, *first,* perfect safety; as he considers it impossible that a vessel on this construction could capsize.—*Secondly,* the vessel being always upright, is constantly on what is termed her *lines,* and is always in her *trim;* whereby she will sail faster, and go better to windward.—*Thirdly,* the support for the mast, &c. being within the vessel, the width of beam may be diminished to one half, whereby the vessel will acquire length, and go faster.—*Fourthly,* the ballast being *suspended in the air* is of more effect than ballast placed in the bottom; the latter being identified with the vessel, and the water loses as much of its weight as is its specific gravity; while the former being indepen-

* Mr. Clint, of No. 5, Rolls' Buildings, Chancery Lane.

dent of the water, and maintaining all its weight, a much smaller quantity will be required to steady the mast, and the vessel itself requiring none, a great degree of buoyancy is obtained. The truth of this position may be ascertained by holding in the hand a weight in the air and holding it in the water.

A vessel on this principle has been constructed by Mr. Clint, of the following dimensions: length 25 feet, breadth 5 do. depth 2½ do. space for the cassoon 5 feet square, cassoon a good fit to the same size. She was rigged with one mast of nineteen feet, carrying a gaft and foresail, and containing fifty yards of cloth. To those conversant with sailing this quantity of rigging must appear very extraordinary; but her capacity to carry it results from the principle mentioned in the position.

With this vessel Mr. Clint made a regular series of experiments during the whole spring and summer of the present year, in the presence of a body of scientific persons, consisting of members of the Society of Arts, officers and seamen of the Navy, and others; several of whom accompanied Mr. Clint to Gravesend, &c. when it blew very hard: and from the great satisfaction given by its performances, the Society of Arts, &c. voted Mr. Clint their large Medal, or Twenty Guineas.

This vessel is in the possession of Mr. Clint, (for sale) and a model, on a scale of half an inch to a foot, is in the Museum of the Society.

This invention is intended only for such vessels as are not employed in the carrying of cargoes, of which class are revenue cutters, pleasure and pilot boats, cartels; nor is it intended for vessels above seventy tons, which may have the box decked in.

MR. SCHEFFER'S LIFE PRESERVER.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"THE satisfaction testified by the public on Thursday last, (the 23rd) when I made a practical exhibition on the Thames, of the advantages of my newly-invented Life Preserver, as reported in the Times, Courier, and other newspapers, has induced me to solicit a small space in your valuable columns, for the purpose, *firstly*, of directing the attention of your readers to the 85th page of the First Volume of your valuable Work, wherein the invention is very correctly described, and its peculiar form illustrated by engravings:—and, *secondly*, for making them acquainted with an improvement that I have since made to the machine, the utility of which I have recently so amply demonstrated before thousands of spectators, as stated by the several newspapers before-mentioned. This improvement consists in the addition of a strap and buckle, by means of which it may be taken off or put on again by a person whilst in the water, as I repeatedly showed on the occasion alluded to. Thus good swimmers may use them at pleasure, put them on to rest when fatigued, or when attacked by the cramp; in going to the assistance of a drowning

person, it may be placed under his arms with facility, and thus supported, he might be easily propelled to the shore by a good swimmer.

"At Brighton, and several other watering places, I have satisfactorily proved that my Life Preserver does really possess that superiority over all others, which you so decidedly expressed in your account of the invention. "I remain, &c.

"1, *St. Dunstan's Hill,* "J. SCHEFFER."

"*25th Sept.* 1824.

MR. WHITE'S FLOATING BREAKWATER.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR, "*New Road, Regent's Park.*

"HAVING seen the communication (signed A. F. B.) in your excellent Register of the 4th instant, in which your correspondent has been pleased to observe that my Floating Breakwater is not a new invention, referring to the Repertory of Arts for September, 1823, * vol. xli. p. 206, also to the proposition of General Bentham for a work of a similar nature at Plymouth. I trust you will permit me to say, that my experiments were made in the open sea at Dover, in May 1822, in the presence of Messrs. Atkinson and Harrison, architects, of London; Mr. Shipdem, the Registrar of Dover; and several other gentlemen of science. I am now acquainted that General Bentham made a proposal to Government, but its precise nature I am still uninformed of.

"I am, Sir,

"*Sept.* 23*d*, 1824. "Your most humble Servant,

"JOHN WHITE."

ACCOUNT OF THE LAVA THROWN OUT BY BURNING MOUNTAINS.

THE Lava at its first discharge from the volcano is in a state of intense ignition, greatly superior to any thing we can have an idea of, from the small artificial furnaces made by us.—Sir William Hamilton informs us, that the Lava of Vesuvius, at the place where it issued in the year 1767, "had the appearance of a river of red hot and liquid metal, such as we see in the glass-houses, on which were large floating cinders half lighted, and rolling over one another with great precipitation down the side of the mountain, forming on the whole a most beautiful and uncommon cascade." The pumice stone, with which your readers are no doubt familiar, swims on the top of this Lava, emitting a faint blueish light, and when broken is frequently found to enclose chrystals of quartz, feldspar, and particles of ferruginous mica—these mostly occur in the dark reddish brown kind.

* Should be 1822.

The composition of the Lavas of different volcanoes is extremely various, and this difference of composition contributes not a little to the facility or difficulty with which they afterwards receive earth capable of vegetation. Some have undergone a more perfect vetrification than others, and are consequently less liable to the impressions of time. The Lava assumes a difference at different times during the same eruption. It has been observed as fluid and coherent as glass; at other times it has been seen to separate particle from particle, like meal coming from under the grindstones. A stream of Lava of this sort would certainly be much sooner fit for vegetation than the other. Bergman, who has analysed some Icelandic Lavas, informs us, that one kind is very coarse, heavy, and hard, full of small bladders, almost black, intermixed with white grains resembling enamel or quartz; some is cubic. This black matter is not attracted by the magnet; but if a piece of it is held against a compass the needle visibly moves. When analysed in the dry way, it yields 10 or 12 pounds of iron per cwt. It does not dissolve in the least with sal sodæ, and the salt called borax has very little effect on it. Alumina seems to be a considerable ingredient, which may be dissolved by the powerful acids. The Lava of Solteferra, in Italy, contains a large quantity of alumina.

As the Lavas are thrown out of the volcanoes in the highest degree of ignition, it may be easily supposed that such vast bodies will retain their heat for a long time. It would, indeed, be well worth observing, what length of time it required to cool a Lava perfectly. Sir William Hamilton in the month of April 1771, thrust sticks into the crevices of Lava thrown out from Vesuvius in October 1767, and they immediately took fire. No observation, however, seems to have been made as to what proportion of heat is given out of Lavas in a certain time.

T. P.

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 17.—Optics.

Description of the Eye.

(Continued from page 13, *Vol.* 2.*)*

The external coat, or membrane, is called the *sclerotica*; it is strong, elastic, and of a white colour, resembling parchment; the hinder part is very thick and opaque, but it grows gradually thinner, as it advances towards the part where the white of the eye terminates. A circular portion of it in front is perfectly transparent, and more convex than the rest; this is called the *cornea*.

Immediately adherent to the sclerotica within, is the *choroides*, which is a soft and tender coat, composed of a multitude of vessels. This membrane is inwardly of a russet-brown colour, almost black. Like the sclerotica, it is distinguished into two parts; the fore-part being called the *iris*, while the hinder-part retains the name of choroides. The fore part commences at the place were the cornea begins:

it here attaches itself more strongly to the sclerotica by a cellular substance, forming a kind of white narrow circular rim, called the *ciliary circle*. The choroides separates at this place from the sclerotica, changing its direction, turning, or rather folding, directly inwards, towards the axis of the eye, cutting the eye, as it were, transversely.

This part, called the iris, is composed of two kinds of muscular fibres; the one sort tending, like radii, towards the centre of the circle, and the other forming a number of concentric circles round the same centre. The central part of the iris is perforated, and the orifice, which is called the pupil, is varied in magnitude by the action of the two sets of fibres composing the iris. When a very luminous object is viewed, the circular fibres contract, and diminish the orifice; and on the other hand, when the objects are dark and obscure the radial fibres of the iris contract, and enlarge the pupil so as to admit a greater quantity of light. The iris is differently coloured in different persons: in some it is blue, in others brown, or of a hazel colour.

The whole of the choroides is opaque, by which means no light is allowed to enter into the eye, but what passes through the pupil. To render this opacity more perfect, and the chamber of the eye still darker, the posterior surface of this membrane is covered all over with a black mucus, called the *pigmentum nigrum*.

From the part of the choroides, called the ciliary circle, arise a set of radial fibres, turning inwards towards the centre of the eye, and filled up between with a black mucus, giving it the appearance of a membrane. This serves to support the *crystalline humour*, to be described afterwards, and is called the *ligamentum ciliare*, or ciliary ligament.

The third and last membrane of the eye is called the *retina*. This is a fine and delicate membrane, being an expansion of the medullary part of the optic nerve. It is spread like a net all over the concave surface of the choroides, and terminates at the ciliary ligament. It serves to receive the images of objects produced by the refraction of the different humours of the eye, and painted, as it were, upon its surface. It is itself transparent, but appears black, by reason of the pigmentum nigrum spread underneath it. From the hinder part of the eye (but not from the centre part), proceeds the optic nerve, which conveys to the brain the sensation produced upon the retina.

The coats of the eye which invest and support each other after the manner of the concentric coats of an onion, or other bulbous root, inclose three transparent bodies, called the *aqueous*, *crystalline*, and *vitreous humours*.

The *aqueous* humour is the most fluid, being thin and clear like water: it fills up the space between the cornea and ciliary ligament, being divided into two portions by the iris, which swims in it. These are called the anterior and posterior portions of the aqueous humour.

The second humour of the eye, is the *crystalline*, which is as transparent as the purest crystal; but in consistence like a hard jelly, growing somewhat softer from the middle towards the edges. Its form is that of a double convex lens, but more convex on the interior

than on the exterior surface. This humour is contained in a very strong and transparent membrane, called the *arachnoides*, and is suspended behind the aqueous humour by the ligamentum ciliare.

The *vitreous* is the third humour of the eye: it receives its name, like the others, from its appearance, which is like melted glass. It is not so hard as the crystalline, nor so liquid as the aqueous humour. It fills all the interior chamber of the eye, behind the crystalline humour.

[*To be continued.*]

MAGNETISM.

Mr. Barlow's Neutralizing Plate.—We are happy to learn that this eminent natural philosopher has received the highest reward, viz. that of £500 given by the board of Longitude, for his plate for neutralizing the action of the iron of ships in producing a deviation in the compass. The centre of a small circular iron plate is placed on the line of the attraction of the ship's iron, and at a proper distance behind and below the pivot of the compass needle, the position of this line having been ascertained previously to the ship's leaving port, an operation which will be greatly facilitated by a table for this purpose prepared by Mr. Barlow. When this is done, the needle will remain active and vigorous in the polar regions, and will direct itself in the true magnetic meridian, in whatever part of the world the ship is placed.

This effect of Mr. Barlow's invention has been experimentally established between the 61° of south latitude and the 81° of north latitude, by the accurate observations of Lieutenant Foster, and by other naval officers. There are few scientific inventions of modern times more truly beautiful in principle, and more useful in practice than this of Mr. Barlow's. *Dr. Brewster's Journal.*

Mr. Scoresby's New Experiments on Magnetism.—Mr. Scoresby had formerly shewn, that bars of steel could be rendered highly magnetic by hammering them in a vertical position, with the lower end resting upon a poker or rod of iron. This process however he has greatly improved by hammering the steel bars between two bars of iron. The steel bars were the eighth part of an inch in diameter.

When only one bar of iron was used, a steel wire six inches long lifted a nail weighing 186 grains; but when two bars of iron were used, the wire lifted 326 grains. When the new process was employed with an iron bar eight feet long, a steel wire six inches long lifted 669 grains, or four times its own weight.

Mr. Scoresby's theory of the process is, that percussion on magnetizable substances in mutual contact inclines them to an equality of condition, in the same manner as all bodies of different temperatures tend to assume the same temperature when in contact. The two great iron bars being made magnetical by position, the interposed bar of steel will therefore, when thrown into a state of vibration by percussion, receive a portion of their magnetism, In like manner a magnet, when struck in the air with a piece of flint, or upon a body of inferior magnetic quality, will have its magnetism diminished.—*Ibid.*

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Colouring of Glass.—Glass is often tinged of various colours, which is performed by mixing with it, while in fusion any of the metallic oxides. Thus green is formed by the oxide of iron; blue by the oxide of cobalt; red by a mixture of the oxides of copper and iron; violet by the oxide of manganese; white by the oxide of arsenic and zinc; purple by the oxide of gold; yellow by the oxide of silver, or by combustible bodies.

Steel.—If the purest malleable iron be bedded in pounded charcoal, in a covered crucible, and kept for a certain number of hours in a strong red heat (which time must be longer or shorter, according to the greater or less thickness of the bars of iron), it is found that by this operation, which is called cementation, the iron has gained a small addition of weight, amounting to about the hundred and fiftieth or the two hundredth part; and is remarkably changed in its properties. It is much more brittle and fusible than before. Its surface is commonly blistered when it comes out of the crucible; and it requires to be forged to bring its parts together into a firm and continuous state. This cemented iron is called steel. It may be welded like bar iron, if it have not been fused or over cemented; but its most useful and advantageous property is that of becoming extremely hard when ignited and plunged into cold water. The hardness produced is greater in proportion as the steel is hotter and the water colder.

Action of Ammonia on Metallic Copper.—Dr. Maculloch has observed, that metallic copper dissolves rapidly in solution of ammonia at a boiling heat; the water being decomposed during the process, its oxygen united to the copper, and its hydrogen evolved in the gaseous form. He suggests the application of this process to the purpose of colouring gold trinkets, as it is called, or dissolving out to a certain depth the copper of the alloy they consist of, so as to leave a coat of pure gold on their surface.—*Tilloch's Magazine.*

Perpetual Motion.—It is now whispered that this long sought philosopher's stone has at length been discovered. The immortal inventor has effected it by means of certain simple machinery appended to clock work, which is wound up by it at proper intervals!! Ye upper stars hide your diminished heads!

Perspired Vapour.—When the temperature of the body is much increased either by a hot atmosphere or violent exercise, the perspired vapour not only increases in quantity but assumes the liquid form. It cannot be doubted that besides water *carbon* is emitted from the skin, but in what state experiments have not yet decided. Mr. Cruickshanks found that the air of the glass vessel in which his hand and foot had been confined for an hour, contained carbonic acid gas, for a candle burned dimly in it, and it rendered water turbid. And Mr. Jamie found that air which had remained for some time in contact with the skin consisted almost entirely of carbonic acid gas.

Ignis Fatuus.—It seems mostly occasioned by the extraction of phosphorus from rotting leaves and other vegetable matters.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

DIBBLING MACHINE.—To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances and proper depths.—The Silver Medal, or Fifteen Guineas.

DYEING WITH LAC LAKE.—To the person who shall invent and discover to the Society a process for dyeing silk, wool, or cotton, with lac lake, superior to any now in use.—The Gold Medal, or Thirty Guineas.

CLOTH FROM NEW SOUTH WALES WOOL.—To the person who shall manufacture the finest specimen, at a fair market price, of cloth from wool imported from New South Wales, not less than thirty-five yards, without any admixture of other wool.—The Gold Isis Medal.

VIGNETTE.—For the best design of a vignette, to be printed at the head of the Society's letters, &c.—The Gold Isis Medal.—The design to remain the property of the Society.

LITHOGRAPHY.—For the best specimen in this art.—The Silver Medal.

RECENT PATENTS.

To WILLIAM JOHNSON, of Great Totham, in the county of Essex, gentleman, for his invention of a means of evaporating fluids, for the purpose of conveying heat into buildings for manufacturing, horticultural, and domestic uses, and for heating liquors in distilling, brewing, and dyeing, and in making sugar and salt with reduced expenditure of fuel.—Sealed, August 5, 1824. Four months.

To THOMAS WOOLRICH STANSFIELD, of Leeds, in the county of York, merchant, for his invention of certain improvements in power looms, and the preparation of warps for the same.—Sealed, 27th July. Six Months.

To EDWARD CARTWRIGHT, of Brewer-street, engraver and printer, for his invention of improvements on, or additions to, roller printing presses.—Sealed, 27th July. Two Months.

TO OUR READERS AND CORRESPONDENTS.

We have received a Letter from a Correspondent, signed "Jack Marline Spike," relative to "Mr. Blyth's new mode of working a Ship's Pumps," given in our last. His chief objection consists in the supposed difficulty of raising the water to the upper or main deck; to effect which our mechanical readers must see there is no sort of difficulty,—and that by the employment of *lifting* pumps the water might be raised, if necessary, to the mast head. Our correspondent makes another objection to the plan, on the ground of the increased space required for the machinery—he does not seem to consider that the cog wheel is placed close to and underneath the deck, and that the pinion and shaft occupy scarcely any useful room.

A. X.—A Friend and Admirer.—and H. W. will meet with our earliest attention.

C. C. will find something at our Publisher's for him.

W. W. is requested to read the observations on Mr. Brown's New Vacuum Engine in our last number, in which he will find an answer to all his questions.

We sincerely thank J. L. for his very interesting Communication, which would be a treasure to a literary Work, but we are under the necessity of parting with it as unsuited to a Register of the *Arts and Sciences*. It is left at our Publisher's to be returned.

The several Communications from W. P.—H. L.—Pe-kong.—A Young Mechanic.—A Gimblet.—and Old Nick, are received.

The First Volume of this Work is now complete, with a copious Index, price 6s. 6d. in boards.

[*To be continued every* FORTNIGHT.]

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REGISTER

OF

THE ARTS AND SCIENCES.

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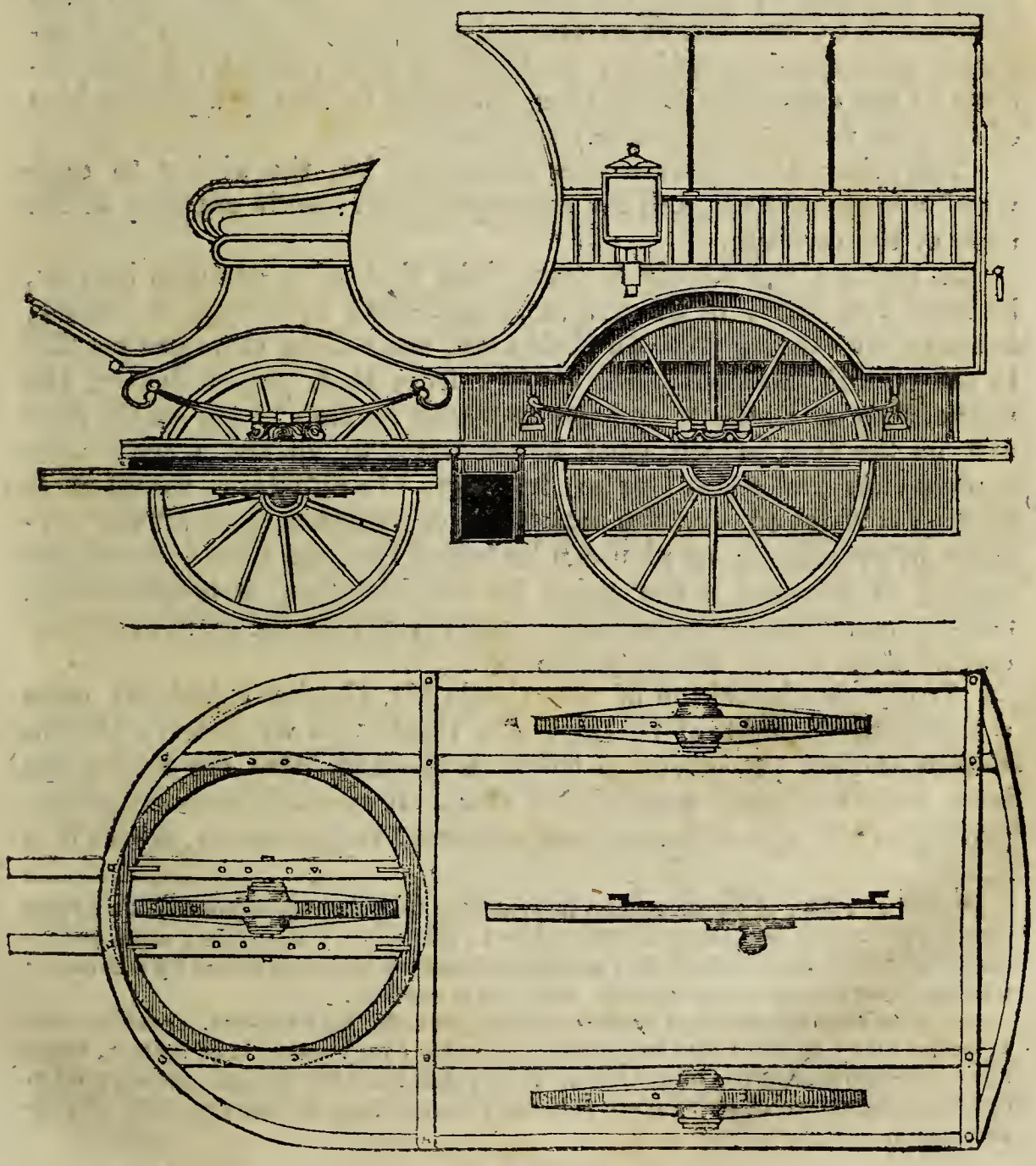
CONTENTS:

Inventions Discoveries and Processes.

Mr. Gordon's Patent improvements upon Wheeled Carriages 34
On preventing Explosions in Gunpowder Mills 35
White's Floating Breakwater .. 37
Timber Steam Kilns 38
Portable Gas Light Companies .. *ib.*
Extraordinary Surgical Instrument 39
Improved Filtering Stone..... *ib.*
Portable Evaporator 41
Albumen, nature and uses of ... 43
Alcohol, do. 44
——— Processes for obtaining, 46
Brandy, ditto from Potatoes ... *ib.*
Elements of Natural Philosophy No. 18, Optics, ... 46, 47, 48
Correspondence 48



MR. D. GORDON'S PATENT CARRIAGE.

MR. GORDON'S PATENT IMPROVEMENTS UPON WHEELED CARRIAGES.

At a time when carriages are about to make a dead set against the brute creation, and, no longer submitting to the inglorious pursuit of the horse's hoof, are now like the Greeks asserting the rights and dignities of their race;—when, indignant at the shame, the apathy, and vis inertiæ which have characterized their ancestry, they can now no longer sustain the shafts of malice and the wheel-wright, but—tearing asunder the traces of their ignominy, and trying their hand at an ærial flight—can dare to display their broad and open fronts to the astonished multitude, no subject can, we suspect, be more generally interesting than the improvements under which the carriage community is now appearing.

Independently, however, of this consideration, and of the desire to satisfy the anxiety which is seriously increasing in the public mind, we are induced to notice the improvements which have thus been introduced by the Patentee, from their extreme simplicity and apparent goodness of principle; so simple, indeed, that a mere examination of the engraving would seem sufficient to convey a precise idea of the plan without explanatory references.

The principal improvements appear to be, the giving to each wheel a separate axle, and the consequent increase in capacity of the body of the carriage.

In causing the wheels to turn, like that of a common barrow, between two rails, or bars, a most important advantage is gained; because, by turning truly on their axes, and rolling therefore parallel to the ground, without being thrown from their perpendicular, the unevenness of motion* and the immense friction, both on the road and on the axle, which must be produced by dished wheels with conical rims and conical axles, is saved. In situations where great friction is required, and the action of the wheels sought for the purposes of *grinding*,† no plan can be better than the latter, but where facility of draught is the point for consideration, it is quite clear, that the more truly perpendicular a wheel can roll, the more decidedly certain must be the saving of friction.

From this disposition of the wheels Mr. Gordon calculates upon a saving of draught of at least one third, and we observe that in France, where the invention has been adopted, that the saving has been estimated at a much higher rate. It certainly does seem surprising in this age of general and universal improvement, where it is

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* We consider it by no means improbable that the rapid destruction of our street pavements is mainly attributable to this cause; the stones must necessarily be much loosened by that tremulous motion which is given by a conical-wheeled carriage passing rapidly over their surface.

† Who that has noticed those droll rogues the *fly waggons*, crushing and grinding away to utter and impalpable powder every particle of matter, large or small—hard or soft—no matter to them, that has lain in their unlucky way, can have failed to observe their sublime effectiveness in the property of pulverization.

difficult to move without jostling against a patent of some kind or another, that all our wheeled carriages should continue to be constructed in direct opposition to the first principles of mechanics, and the absurdity of the system has been pointedly illustrated by the late Mr. Edgeworth, in his Work on Roads and Carriages, than whom few men had given the subject greater attention.

The idea of giving a carriage but three wheels upon the principle that it is more difficult to overturn a three-legged stool than one with its full complement of four, strikes us as ingenious and happy, and we willingly subscribe to the doctrine that little danger of an overturn is to be apprehended.

It will be observed by referring to the Engraving, and it is the only part that needs particular description, that the third wheel also rolls between two bars, and that to each of these bars are affixed two iron shoulders, or clenches, which move freely upon the circular iron plate that is bolted to frame work in front; by this simple contrivance is the wheel made to follow the direction of the shaft attached to the projecting arms of the two bars, without ever being thrown from out its perfect perpendicular.

The improved mode which the Patentee adopts of placing the third wheel in this position renders unnecessary any traverse bolt, and as it never changes its place like the fore-wheels of a common carriage when turning, less space must be of course occupied, and the centre of gravity of the load is never changed. From the circumstance of there being no cross-axle between the hind wheels, it will therefore be seen that great additional room is given for stowing goods and luggage, as the body of the carriage can be sunk to within a few inches of the ground; and it is the great and unbroken increase of space which is thus obtained that strikes us as making a carriage of this description peculiarly suitable for Vans, or for propulsion by mechanical means.

We think that these improvements must be considered as evidently valuable, inasmuch as that, independently of the advantages above enumerated, equal strength may be thus effected with greater lightness of construction, the danger of overturning is averted by bringing the centre of gravity nearer to the ground. The wheels of the carriage can never fly off, nor be locked in those of another. Far greater facility in loading and unloading, and that carriages upon such a construction are susceptible of a greater variety of ornamental and more commodious shapes than those which are now in use.

ON PREVENTING EXPLOSIONS IN GUNPOWDER-MILLS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I OBSERVE, in your valuable Register of the Arts and Sciences, an invitation to the Public 'to discover to the Society, 'the most effectual mode of preventing Explosions in Gunpowder 'Works.'

"Explosions in Gunpowder Works must arise from one of the three following causes.

"1st. From a small particle of grit intermixing with the composition.

"2nd. From too much heat in the drying of the gunpowder.

"3rd. From electric fluid.

"To prevent the possibility of any grit being in any of the component parts of gunpowder; the salt-petre should be dissolved in pure water, filtered, and crystalized; this, in the cleanest specimen of salt-petre, must be done three times in the less pure; the process of crystalization and filtration should be four times repeated, previous to the water of crystalization being evaporated.

"To remove any and every impurity from the sulphur, it must be heated in a copper to liquifaction, the scum as it rises to the top removed as long as it continues to rise, the liquid sulphur drawn from the copper into tubs of wood, left to subside and cool. The impurities in sulphur being lighter or heavier that the brimstone will either rise to the top, or fall to the bottom; the top and the bottom of this lump of sulphur must be rejected, the centre part only used for the manufacture of gunpowder; but previous to being so used, it must be a second and third time subjected to the same process, when its purity may be fully relied upon.

"The wood for charcoal ought to be placed, previous to the bark being taken off, in rooms carefully swept, to remove every possibility of gravel or dirt; the wood ought to be strewed in cylinders, and care taken that it does not come in contact with the earth in placing in or removing from the cylinders.

"Every process connected with the manufacture of gunpowder must be conducted in isolated store-rooms to prevent any dust flying into the apartments. The workmen should be compelled to leave their shoes and clothes in the wash-house, dress in flannel or calico dresses, and magazine slippers, kept for the purpose, before beginning work.

"The beds and runners should be wrought smooth and highly polished, care being taken by the millman not to strike the runners with any hard substance, so as to risk the dislodging from the stone an atom of gravel, the pressure of which may inflame the charge; every charge ought to be occasionally moistened with distilled water, by no means with water taken casually out of the river.

"The salt-petre, sulphur and charcoal ought to be separately reduced to a fine powder under runners, kept expressly for that purpose, and passed through *a sieve, or reel,** both before and after mixing, carefully rejecting every suspicious particle.

"Each charge of powder ought to be removed from the mills to the corning-house by water in a covered inclosed boat, from the corning-house to the dusting-house, glazing-house, and steam-stove.

---

* The reels at the Royal Powder Works are of brass wire, twenty-four meshes to the inch.

"2. No gunpowder ought to be dried otherwise than by steam, and under the care of a stove man, who on no consideration should be ever absent from his duty during the process of drying; and who should have a thermometer before his eyes, that he may so regulate the heat as to prevent the possibility of explosions. The gunpowder ought to be removed in the same manner, and with the same care from the stove (where it must be barrelled) to the magazine, immediately after the drying is completed.

"The floors of every room where any of the processes of making gunpowder are conducted, should be covered with tanned hides swept and watered before beginning, and after finishing work daily.

"It is unnecessary to state that any person having the least appearance of intoxication should not be allowed to come near the work. No stranger ought to be admitted, no iron, or iron tools, to be used.

"3. To avoid the probable consequences of lightning, the alarm should be given on the first appearance of a storm, and on hearing the first clap of thunder, or on seeing the first flash of lightning, however distant, all the windows and doors are to be immediately closed; the men employed in exercising the engines and throwing water over the buildings when gunpowder is in store, or in process, during the continuance of the thunder storm.

"By a firm enforcement of these regulations no explosions will take place; none have occurred in this manufactory for many years, where it is conceived more gunpowder has been made than in the whole Island.

"*Royal Powder Works,* "I am, Sir,
"*Waltham Abbey,* "Your obedient Servant,
"*Sept. 28th,* 1824. "EMPSON MIDDLETON."

FLOATING BREAKWATER.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"As I have neither any interest nor any inclination to trouble you upon the subject of the Floating Breakwater, I should not have further noticed Mr. White's Letter to you were it not that there appears in the present month's Repertory a Letter from Mr. Gordon, of which I transmit you a copy. It seems to me to set the matter at rest as to priority of invention; for even by Mr. White's own showing, he first exhibited his Floating Breakwater in May, 1822, and Mr. Gordon's patent appears dated the January (1822) preceding. Mr. White's patent is dated 15th January, 1824.

"I am, respectfully, Yours, &c.

"*Harrow, October 5th,* 1824. "A. F. B."

[COPY.]

"'GENTLEMEN,

"'MR. WHITE having obtained a Patent for a 'Floating Breakwater, and Mr. Newton having in the Journal of Arts 'noticed it as a new invention, I take leave to refer your readers to

'the Repertory of Arts for September, 1822, vol. xli. p. 206, where 'you have inserted the specification of my patent, dated 14th January, 1822, containing my improvements on Floating Breakwaters.

"'I had, from observing the effects of a field of ice aground between two islands, and at the mouth of a bay, and large American 'rafts anchored in similar situations, many years ago contrived a 'Floating Breakwater, and for long thought myself the first inventor 'thereof; but upon returning to this country I discovered that General Bentham "had proposed to make Floating Breakwaters in '"separate parts or floats of wood, to make the floats of a triangular '"or rather a prismatic shape, and to hold them in their place by '"means of iron chains, &c."* And that he had actually given in 'a plan and estimate for forming the Breakwater at Plymouth, of '*wooden floats*, the cost of which he calculated at £201,026. Under 'these circumstances I saw it was impossible to claim being the first 'inventor of Floating Breakwaters, and limited my claim to improvements thereon.

"'I humbly think that both General Bentham's and Mr. White's 'plans are defective in several particulars, even other than I could 'include in my specification, and which I propose to give an account 'of in some observations on sea walls, piers, and breakwaters.

(Signed) "'DAVID GORDON.'"

TIMBER STEAM KILNS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I BEG leave to solicit a corner of your valuable work for an idea which suggested itself to me respecting Steam-Kilns.

"Where a Steam-Kiln is in constant use for a whole day, it becomes necessary to replenish it during that time with water to supply the waste by evaporation, and this is generally done by opening the lid and refilling it with buckets.

"This necessarily for a time stops the work, but this is not the worst; for the cast iron boilers are frequently cracked and rendered useless by the sudden contact of the cold water. Now I propose that a small forcing pump be used to inject a gradual and constant supply of water.

"This might be worked by the boy attending the kiln fire, and it might be made to screw on and be removed when not in use.

"Should this meet the approbation of any of your readers who may put it in use, I doubt not but it will answer every expectation of

"*Rotherhithe Street,* "Sir, your's, respectfully,

"*Oct. 7th,* 1824. "A SHIPWRIGHT."

"PORTABLE GAS LIGHT COMPANIES.—Our readers will have much satisfaction in learning, that the Portable Gas Company of

* Circle of Mechanical Arts, by Thomas Martin, p, 311.

London is succeeding beyond the most sanguine expectations of its projectors; and the use of the Portable Gas Lamp, invented by our townsman, David Gordon, Esq. is hourly extending, and will soon be in general use wherever oil gas is manufactured. Companies have been formed, and extensive machinery is manufacturing for Paris, Rouen, and Amsterdam; and companies are forming in Manchester, Dublin, Bordeaux, Lyons, and Nantz. Why is Edinburgh, where this invention was made, and first exhibited, the last capital to patronise and adopt it?"—*Brewster's Journal, No. II.*

It is with feelings of real satisfaction that we insert the preceding extract from the most scientific journal of the day, not only because we were the first to give an account to the world of that highly interesting and valuable invention, but that its successful career has been unchecked by the malignant attacks of envy and ignorance which were made upon it at its outset

CIRCULAR SAW EMPLOYED IN THE HUMAN BLADDER FOR DESTROYING CALCULI.—It appears from a report made to the Academy of Sciences by M. Percy, that this extraordinary expedient proposed by Dr. Civiale has actually been carried into practice, and so successfully, that several patients have been completely cured without confinement, and almost without pain; in one of the cases the calculi was as large as a pigeon's egg.

A straight silver sound is introduced through the passage into the bladder, which contains a second of the same metal likewise hollow, but terminating with spring branches which lie close together when confined by the principal sound, but which open into a sort of cage when thrust beyond it, into this the operator causes the stone to enter, and then closes the cage upon it by withdrawing the interior sound a little. Within the interior sound is a long steel rod, at the end of which, and between the branches of the cage is a small circular saw, a file, or other instrument, according to circumstances. The stone being thus held fast by the operator, the steel rod armed with its instrument is pressed against it, which is made to revolve by means of a spring drill-bow acting upon a small wheel at the external end of the steel rod. A dull sound from the rubbing or breaking down of the calculus is immediately heard. The operation is soon over, and usually concludes by the ejection of the fragments by the patient. The process has been practised before the Commissioners of the Academy.

IMPROVED FILTERING STONE.

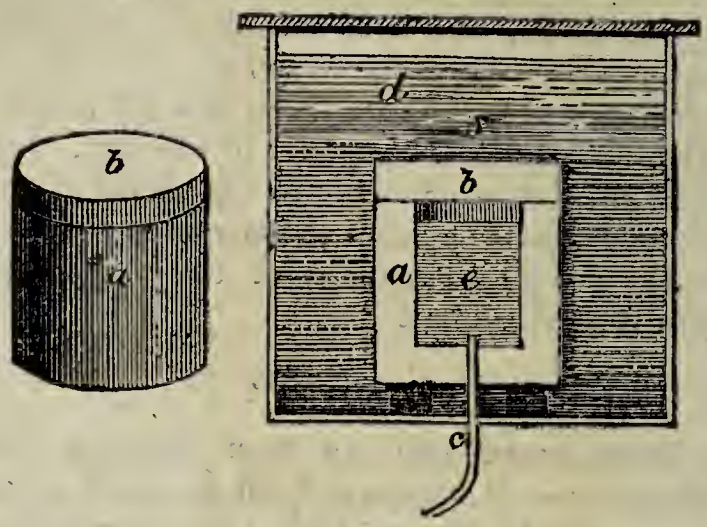
"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"PASSING through Duke Street, Grosvenor Square, my attention was excited by the exhibition of a filtering stone, which appearing to me to be a decided improvement upon all that I had

hitherto seen, I was induced to make some inquiry relative to its advantages of the proprietor, who is a plumber and glazier, and makes them for sale, but whose name I forget. He shewed me one of the same kind that he had evidently had in use a considerable time for filtering water for his family. It was of a cylindrical figure, similar

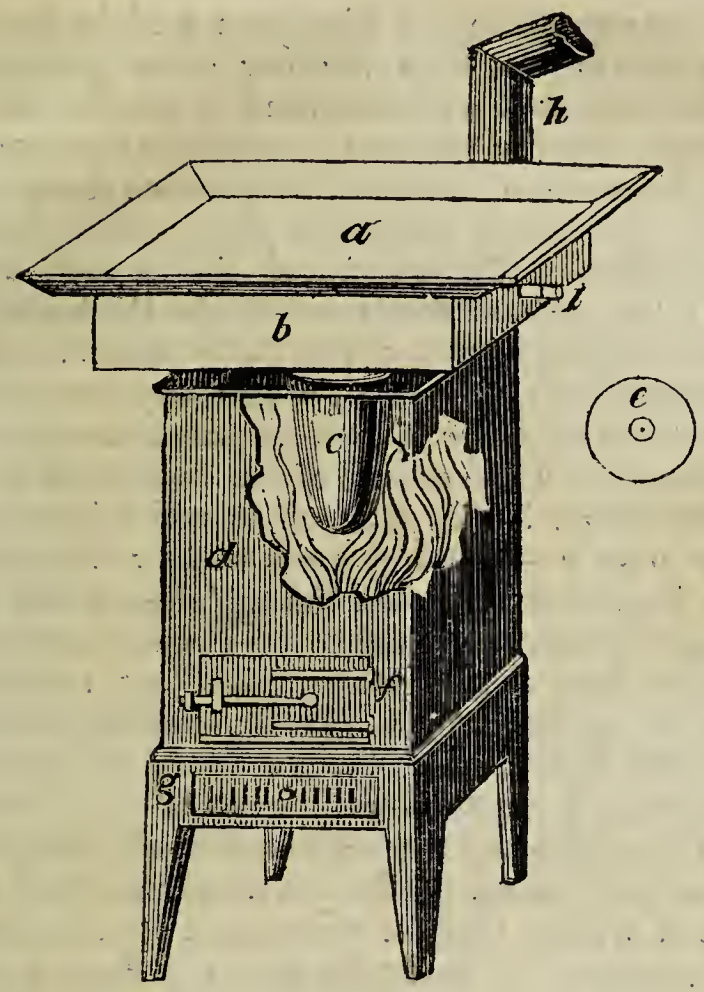
Fig. 1. *Fig.* 2.



to that shewn at *fig.* 1 in the above sketch, and was submerged in the cistern of water supplied by the water company of that district, which I have likewise endeavoured to represent by *fig.* 2, which gives the cistern and filtering stone in section. *a* is the hollow cylindrical stone, which is of a hard grit and of great porosity; *b* the cover made of the same kind of stone, which is cemented to it after the cylinder has been hollowed out. The water is received into the cistern in the ordinary way and in its usual impure turbid state, as shewn at *d*, and surrounding the whole external surface of the filtering stone, it quickly passes through into the reservoir within, depositing its sediment on the exterior of the stone, shewn by the dark shadow round it as at *s*. The filtrated water contained within the stone was as bright as crystal, which he shewed me by drawing off a portion by means of a cock attached to the end of the pipe *c*, which is inserted through the bottom of the stone for that purpose. Thus by this invention the water filtrates from without, and so rapidly, as I was informed, that an ordinary sized stone of about 18 inches long and 12 or 14 in diameter is capable of filtering 100 gallons of water in a day, if the water is allowed to run off as it passes through. This may be owing partly to the great porosity of the stone, and partly to the constant pressure of a great body of water upon so extended a surface. This mode of filtering is entirely new to me, and appears to possess some very decided advantages over the usual methods; which are perhaps too obvious to need enumeration:—but a constant supply of crystal water, and the facility with which the filtering powers of the stone may be at any time renewed, when it shall have become by long use clogged with sediment are, I think, particularly deserving of notice, and I earnestly hope that the inventor may meet with a recompence suited to so excellent a contrivance.

"*Millbank,* "H. T."

"*Oct.* 4, 1824.



PORTABLE EVAPORATOR.

" To the Editor of the Register of the Arts and Sciences, &c.

" SIR,

" THE apparatus described in your last number for boiling and concentrating sugar in solution is unquestionably very excellent, but I am greatly surprised to perceive that the invention should be exclusively claimed by patent right, considering it to be almost universally known that steam boilers on the same principle, and nearly of the same construction, have been in use for a number of years. It is probable they may not yet have been employed on the *large scale* for the making of sugar in the West Indies, but that they have been employed for the boiling and evaporating of solutions of vegetable extracts generally (of which sugar is one) I have good reason to know, having had in use three or four years ago several modifications of a similar apparatus, and I should not have thought them sufficiently novel even for publication in your excellent work, much less as a subject for a patent; but one of them which was of a portable kind, of simple construction and of trifling cost, I found so effective and convenient, that it may possibly be worthy of notice when you have occasion to treat upon the subject of evaporation again.*

" As my account of it may not be sufficiently intelligible without the aid of a drawing, I have annexed a sketch which I would describe

---

* The invention appearing to us of a useful character, we have not hesitated to give it a place by itself.

as follows : *a* is a square tin pan like those used for baking puddings in, about 20 inches by 14, with the four sides projecting over the square tin box or steamer *b* which is fitted to it in the following manner ; to the upper edges of the box *b*, which has no top, is soldered, in a perpendicular position, a kind of double rim made by a doubling of the tin plate, presenting thereby a narrow and deep groove all round the upper edges of the box, about half an inch deep and one-sixteenth wide ; this groove receives a single thickness of tin plate of the same depth, which is soldered to the bottom of the pan *a* ; the object of this mode of fitting is that the pan may be taken off and put on at pleasure, and that other pans if required may be made use of in the same manner.—In the middle of the bottom of the box *b* is a round hole of about four inches diameter to which is soldered the end of a conical iron pipe *c*.—*d* is a common cast iron pedestal drying-stove, with the flue at the back, and the top close with a flat surface ; out of this top of the stove is cleanly cut a circular hole of rather less diameter than the base of the conical pipe just mentioned, which when fitted into it, as shewn in the sketch, cannot go its whole depth into the stove, and thus protects the tin vessel from becoming unsoldered by not being in contact with the stove : *e* is a circular plate of iron made to fit accurately the hole cut out of the top of the stove, which makes the stove complete for use when the steam apparatus is not required, and will be found a convenient arrangement for many other obvious purposes. *f* is the fire door ; *g* the ash pan, with air holes in front, which may be used as dampers to lessen or extinguish the fire, by closing them up partially or wholly with a sliding plate of iron.

" In setting my little machine to work, water is poured into the steam box *b*, so as to fill the pipe *c*, and about an inch above it. The heat and flames acting upon the conical pipe quickly raises the water to ebullition, and the steam attacking the bottom of the pan is immediately condensed and drops into the water ; is raised again and condensed alternately in perpetual cohebation. As the great pressure of the steam might, occasionally, by want of attention, blow off the pan, I provided a simple contrivance to serve the office of safety valve, which was nothing more than a common cork, *i*, inserted into a little conical tube, which was blown out when the pressure was too great. I had another simple method, which answered my purpose very well, for regulating the temperature or force of the steam, which was to pass a little glass tube open at both ends through the cork, and the steam was then permitted to rush out in a fine stream through this pipe, and according to the length of this stream in a horizontal line I knew accurately enough what was going forward within.

" Having now described my apparatus, I have only to add that I found it very effective and convenient for evaporating solutions, and particularly for concentrating vegetable extracts.

" I remain, Mr. Editor,

" *Oct.* 5. 1824. " Your constant reader,

" L. H."

ENCYCLOPÆDIA OF THE USEFUL ARTS.

Our attention has been frequently directed as well by our correspondents as by those of our personal friends, to a subject which we have always considered as peculiarly suited to a work of this description; namely, the introduction of a regular series of papers upon matters connected with science and art, of which the knowledge would be generally serviceable and interesting; and it is in accordance with the wishes that have uniformly accompanied those suggestions that we now present under the above title, the first number of a succession of articles, to embrace in the nature of *an abridged Encyclopædia, all such subjects as shall appear to have the closest relation to general practical usefulness, particularly the various processes and operations by which the multitudinous products and manufactures of the world are obtained or created:* and we confess we shall be somewhat disappointed if it do not form a source of useful information to the general reader, and of profit to those who desire to be practically conversant with the subjects introduced.

The alphabetical arrangement will afford an opportunity to our intelligent readers and correspondents to favor us with much valuable information upon the subjects that are to follow, and we earnestly invite their kind assistance for the more perfect completion of the undertaking.

No. I.

ALBUMEN is derived from the Latin, and signifies the white of an egg, in which it exists abundantly in its purest natural state; and it is one of the chief constituents in all the animal solids. It is found by chemists to exist also in the green feculae of plants. Boiled hard in the shell, and afterwards suspended in the air by a thread, it resolves and drops down into an insipid tasteless liquor, which appears to be that anomalous unaccountable menstruum so much used by Paraceleus; and will (notwithstanding it may appear to possess none of the requisite properties for the purpose) make a thorough solution of myrrh, which neither oil, water, spirits, nor even fire can effect. Putrid white of egg taken into the stomach occasions the most dreadful disorders, and dissolves the humours like the plague; but when fresh, as is well known, it affords excellent nutriment.

In its natural state it is soluble in water, forming a glary limpid liquid which is used as a paste and varnish. The solution is coagulated by acids, alcohol, and by a heat of 170°; the infusion of tan will precipitate it from its solution in water, and the salts of silver, mercury, lead and tin, will separate it in the form of a white powder.

Orfila has found that the white of egg is the best antidote to the poisonous effects of corrosive sublimate on the human stomach, and it would probably form an efficacious remedy in other species of mineral poison, from its known property of occasioning precipitates with most of the metallic salts. White of egg beaten in a basin with a lump of alum till it coagulates, forms the *alum curd* of Riverius, or alum cataplasm of the London Pharmacopœia, much used to remove

inflammations of the eyes. The white of egg has also the remarkable property of rendering leather supple, and is employed for that purpose; it is also extensively used for clarifying liquors.—*See* CLARIFICATION.

ALCOHOL, is highly rectified *spirit of wine,* and is distinguished from it merely by being a stronger or purer spirit, i. e. from its being almost freed from the water and oil, which are intimately combined with the wine from which it is obtained. As the processes of distilling alcohol and the more diluted spirits are given in Numbers 10, 11, and 12 of the Register, we refer our readers to those articles, and shall on this head confine ourselves to a brief notice of the processes lately introduced for the distillation of spirit from the fecula or starch of vegetables, and particularly that of potatoes.

In order to develope the saccharine principle in unmalted grain, and to obtain the spirit from it, it has been the custom of distillers for many years past to mix with it a quantity of malted grain, and to ferment them together, by which means they both acquire the same properties. Guided by this well known fact, several distillers, both in England and on the Continent, have successfully attempted to saccharize the fecula of potatoes, by mixing with the pulp a certain portion of malted grain which produces the desired effect. The methods of conducting this operation vary in different parts of the Continent, but the most-approved process is that of M. Daubrunfaut. He first reduces the potatoes to a fine pulp by a mill (upon a similar principle to that given in the 18th Number of the Register) the pulp is thrown into a brewing tub with a double bottom, upon which boiling water is gradually poured, while it is actively stirred with a rake, to prevent it forming into lumps, until the whole of the fecula is converted into a smooth mucilaginous paste. One twentieth part of ground malt is then added, together with a little wheat straw, which renders the whole mass fluid and saccharine in the space of two hours. The liquid is then drawn off clear into the fermenting tun, and the pulpy fibrous mass being submitted to mechanical pressure, that all the fermentable matter may be extracted, and the whole of the liquid being thus freed from the grosser matter, enables the subsequent process of distillation to be carried on more perfectly. Thus brandy or other spirits may be obtained of excellent quality, and at much less cost than when distilled from the usual materials.

The strongest alcohol that can be obtained by re-distillation, or rectification, as it is termed, still contains a small portion of water, part of which (though not all) may be abstracted by mixing with the spirits a quantity of the carbonate of potass, which has previously been exposed in a crucible to a red heat, to deprive it of its moisture; the salt absorbs the water contained in the spirit, and sinks with it to the bottom of the vessel, and the alcohol swimming above may then be decanted off in nearly a pure state. The alcohol may be treated again with a fresh quantity of the potass, and the process repeated until the salt falls dry to the bottom. The alcohol in this state will be reddened by the potass, from which it may be freed by

another distillation over a water bath. Dry muriate of lime may be advantageously substituted for the carbonate of potass.

The strongest alcohol may be obtained by another very simple, yet dilatory process, which is, to put common spirit of wine into a bladder and suspend it in a warm room, or over a sand-bath. In a few days the spirit of wine will be found to have but one fourth of its volume, by the water having evaporated through the bladder, which is impervious to alcohol.—See BLADDER.

Alcohol being much lighter than water, its specific gravity is adopted as the test of its purity. By simple rectification it cannot be obtained of less specific gravity than 829. By the addition of alkali it may be brought to 813 at 60° Fahrenheit. In the shops it is about 830 to 840. The London College estimate it at 815. The strength of spirits in commerce is determined by an instrument called an *hydrometer*,—which see.

Alcohol is transparent, colourless like water, of a pleasant smell, and a strong penetrating agreeable taste, producing intoxication when swallowed. It is exceedingly fluid, and has never been frozen, though it has been exposed to a cold so great that the thermometer stood at 69°. It is extremely volatile, boiling at the temperature of 176°; in which heat it assumes the form of an elastic fluid, capable of resisting the pressure of the atmosphere, but which condenses again into alcohol when that temperature is reduced. In a vacuum it boils at 56° and exhibits the same phenomena; so that was it not for the pressure of the atmosphere, alcohol would always exist in the form of an elastic fluid, as transparent and invisible as common air. When set on fire it burns away with a blue flame, leaving no residuum, but when the vapour which escapes during this combustion is collected in proper vessels, it is found to consist of nothing but water; and the water thus obtained exceeds the weight of the alcohol consumed by about one seventh part. The chemical constituents of alcohol are carbon, hydrogen, and water.

Alcohol is capable of dissolving a great number of substances, which renders it highly useful in various processes and in analysis. With the sulphuric, nitric, and muriatic acids, it forms sulphuric, nitric, and muriatic aether. The following substances are also soluble in alcohol, in different proportions. All the alkalies, when pure, several of the neutral, earthy, and metallic salts; carbonic acid gas; sulphur in the form of vapour; most of the vegetable acids; the essential oils and odorous parts of vegetables forming when distilled with alcohol, lavender water, and other distilled spirits; all the resins and gum resins forming tinctures and resinous extracts. Camphor is not only readily dissolved in it, but it assists the solution of resins in it. Fixed oils when rendered drying by metallic oxides are soluble in it, as well as when combined with alkalies. Soaps are dissolved with great facility by alcohol, with which they combine more readily than with water. Wax, spermaceti, biliary calculi, and all animal substances of a resinous nature are soluble in alcohol; but it curdles milk, coagulates albumen, and hardens the muscular fibre and coagulum of the blood. From its property of dissolving resinous sub-

stances and essential oils, it is extensively employed in pharmacy, and by the perfumer; besides being the menstruum of that class of varnishes called *spirit varnishes*,—which see.

When alcohol is diluted with an equal quantity of water, constituting what is called proof spirit, it is used for extracting tinctures from vegetable and other substances, the alcohol dissolving the resinous, and the water the gummy parts. From its giving a steady heat without smoke it was formerly much used for heating water on the tea-table, and by the recent introduction of Mr. D. Gordon's Patent Spirit Lamp it is again extensively employed for that purpose. In thermometers it is preferable for measuring great degrees of cold, as it cannot be brought to freeze.

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 18.—Optics.

Of the Manner in which Vision is performed.

(Continued from page 30, Vol. 2.)

As every point of an object sends out rays in all directions, some rays from every point on the side next the eye will fall upon the *cornea*, and by passing on through the humours and pupil of the eye, they will be converged to as many points on the *retina*, or bottom of the eye, and will thereon form a distinct inverted picture of the object.

But that vision is affected in this manner, may be demonstrated experimentally. Take a bullock's eye while it is fresh, and having cut off the three coats from the back part, quite to the vitreous humour, put a piece of white paper over that part, and hold the eye towards any bright object, and you will see an inverted picture of the object upon the paper.

Since the image is inverted, many have wondered why the object appears upright. But we are to consider that "inverted" is only a relative term; and that there is a very great difference between the real object and the means, or image, by which we perceive it. When all the parts of a distant prospect are painted upon the retina, they are all right with respect to one another, as well as the parts of the prospect itself: and we can only judge of an object being inverted, when it is turned reversely to its natural position, with respect to other objects which we see and compare it with. If we lay hold of an upright stick in the dark, we can tell which is the upper or lower part of it, by moving our hand upward or downward; and know very well that we cannot feel the upper end by moving our hand downward. Just so we find by experience that upon directing our eyes towards a tall object, we cannot see its top by turning our eyes downward, nor its foot by turning our eyes upward; but must trace the object the same way by the eye to see it from head to foot, as we do by the hand to feel it: and as the judgment is informed by the motion of the hand in one case, so it is also by the motion of the eye in the other.

The diameters of images at the bottom of the eye, are proportional to the angles which the objects subtend at the eye, the same as in a lens; and are reciprocally as the distances of the same object viewed in different places.

The eye is in reality no more than a camera obscura; for the rays of light flowing from all the points of an object, through the pupil of the eye, do by the refraction of its humours, paint the image in the bottom of the eye; just so it is in the camera obscura, where all the rays refracted by a lens in the window-shutter, or passing through a small hole in it, paint the image on the opposite wall. Some properties of the eye are these:

The eye can only see a very small part of an object distinctly at once. For the collateral parts of an object are not represented distinctly in the eye; and therefore the eye is forced to turn itself successively to the several parts of the object it wants to view, that they may fall near the axis of the eye, where alone distinct vision is performed.

When any point of an object is seen distinctly with both eyes, the axis of both eyes are directed to that point, and meet there: and then the object appears single, though looked at with both eyes; for the optic nerves are so framed, that the correspondent parts in both eyes lead to the same place in the brain, and give but one sensation; and the image will be twice as bright with both eyes as with one. But if the axes of both eyes be not directed to the object, that object will appear double, as the pictures in the two eyes do not fall upon correspondent or similar parts of the retina.

A man can judge at a small distance with a single eye, by frequently observing how much variation is made in the eye to make the object distinct; and from this a habit of judging is acquired. But this cannot be done at great distances, because, though the distance be varied the change in the eye becomes then insensible.

But a man can judge of greater distances with both eyes than he can with one. For the eyes being at a distance from one another, as long as that distance has a sensible proportion to the distance of the object, a habit of judging is effected by the position of the axes of the eyes, which are always directed to that point. For different distances require different positions of the axis, which depend on the motions of the eyes, which we feel. But in very great distances, no judgment can be made from the motion of the eyes, or their internal parts. Therefore we can only guess at the distances from the magnitude, the colour, and position of interjacent bodies.

Whatever light falls upon that part of the retina where the optic nerve springs, it makes no impression; and therefore, if the picture of an object fall thereon, it is not perceived, and that object is invisible. This will appear by placing a small bright object before you, and looking at it with one eye; then moving that eye laterally towards the contrary side (towards the left, if it be the right eye), the object will disappear, and seem to be lost: and moving it still farther, it will appear again. Now this place is not at the bottom of the eye, but nearer the nose in both of them; so that no rays either paral-

lel or diverging that come from any object can fall upon that place in both the eyes: and any object to which we direct the eyes will always be visible at least to one eye. But the same bright object may be made to disappear to both eyes, by directing the axis of both eyes to a point a little beyond the nose, to be found by trials.

Dimness of sight generally attends old people and this may arise from two causes: 1st, by the eyes growing flat, and not uniting the rays at the retina, which causes indistinctness of vision: or, 2nd, by the opacity of the humours of the eye, which in time lose their transparency in some degree, from whence it follows, that a great deal of the light that enters the eye, is stopt and lost; and every object appears faint and dim.

As the rays of light flowing from an object and painting its image upon the retina are the immediate causes of seeing, so where there is no light, there can be no vision, consequently without light the eye becomes a machine utterly useless; as it can give us no manner of information of the existence of bodies at a distance from us.

TO OUR READERS AND CORRESPONDENTS.

In consequence of the great number of Communications we have received, and of Articles whose interest mainly depends upon speedy publication, we are compelled to announce that a SUPPLEMENTARY NUMBER *will appear in the next week. We hope by this means to redeem the pledges we have given to several correspondents of immediate insertion.*

The intentions of J. Y. are certainly laudable, but the means he proposes for the graduated descent of Balloons are we fear impracticable. J. Y. will, we are sure, see this if he re-considers the matter.

PHESOJ is too facetious; no subjects but those of the most dry and fusty nature should be admissible to a work like ours: your philosopher is a sore enemy to fun.

L. W.'s Letter (covering a drawing) upon smoky chimnies, has been received, and shall appear if possible in our next.

A Member of the Mechanics' Institution has written us fully upon the subject of the unhappy differences which have arisen between some of the persons connected with that body; but we cannot admit his Letter. THE REGISTER, we believe, is the only publication that has omitted all mention of it from its very commencement; need we say that we abstained from doing so purposely? we wished too well to the Mechanics to depress, by a single observation of doubt, the ardour which they displayed in the founding of this novel experiment. Constructed as the plan was, we feared for it; we confess we are pained at the result; but let us hope for better things yet to come: and if the conductors will evince that proper and philosophical spirit so necessary to the well-being of an establishment of such a kind, that man must be indeed bad who would not give to it his warmest and best support.

The POSSOR is received.

Our other Correspondents will be attended to next week.

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REGISTER

OF

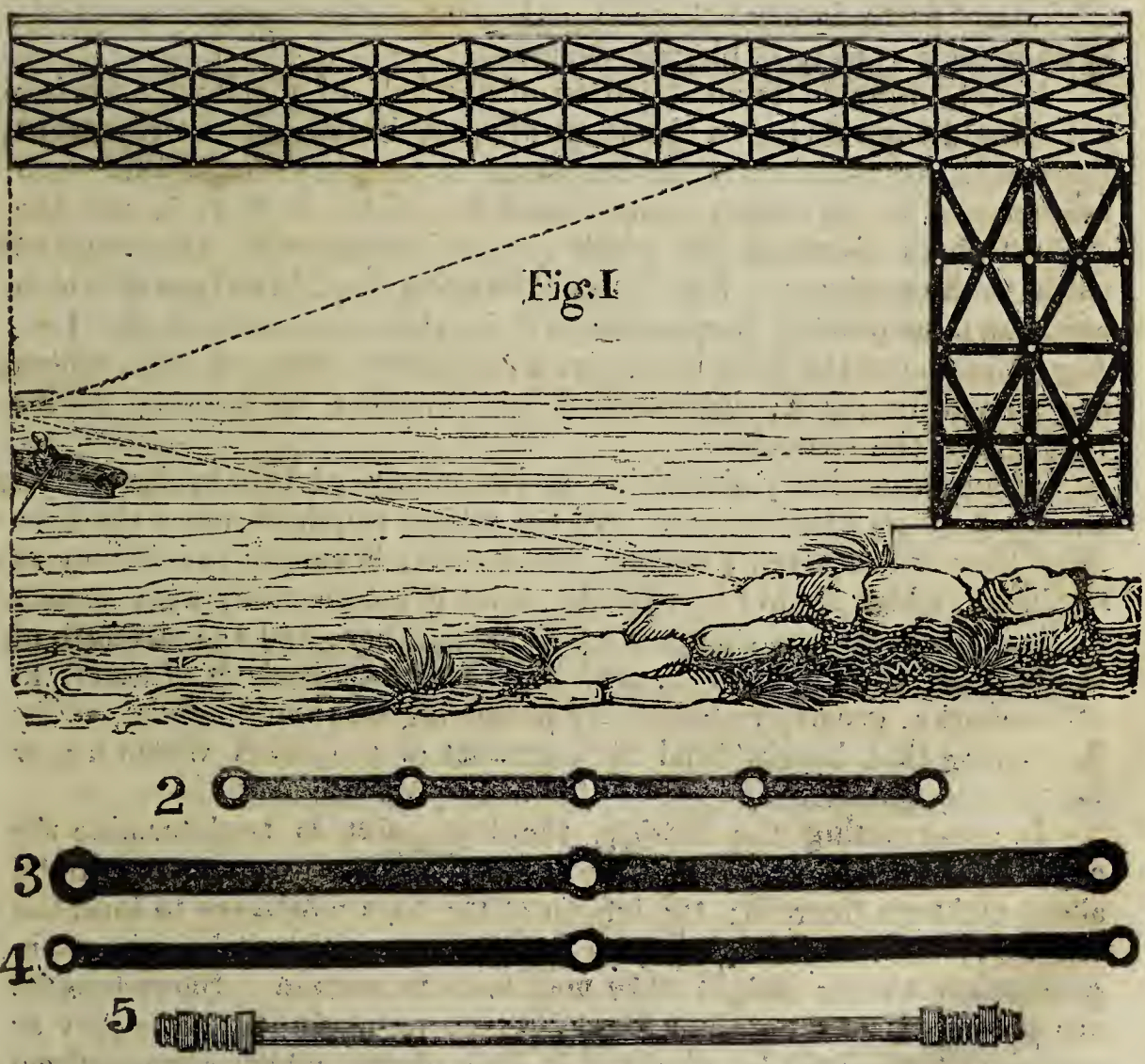
THE ARTS AND SCIENCES.

No. 28.] SATURDAY, OCTOBER 23, 1824. [Price 3*d*.

CONTENTS:

Inventions, Discoveries and Processes.

Smart's Patent Bridge 49
Illuminating powers of Oil and Coal Gas 52
Aerostation 55
Smoke Preventive 56
The Possor 57
Encyclopedia of the useful Arts 58
New Weights and Measures ... 60
Sulphuretted Hydrogen inflamed by Nitric Acid--Ammonia disengaged during vegetation—Chromate of Iron—Pure Hydrogen easily obtained—Fiery Eruption in America—Preservation of engraved Copper-plates—Snow Fleas—Native Oil of Laurel—Substitution of Potatoes for Soap—Court Plaster 62 67
Patents, Premiums, and Correspondents 64



MR. GEORGE SMART'S PATENT IRON BRIDGE.

In consequence of the account which we published in the 23rd number of this Work, of Mr. Smart's beautiful invention of the Bow and String Rafter, our attention has been directed to another invention

of that gentleman's, which forms the subject of the above engraving; to which we have been led by hearing it spoken of in unqualified terms of praise, by persons whose talents as professional engineers, entitle their opinions to the utmost deference.

The first object in building a bridge is *convenience;* and the next, (as a consequence of the first) *strength and durability;* it follows, therefore, that such a construction of a bridge as embraces these important results at the *least expense* is the *best:* and we believe that a very little consideration will convince the reader that Mr. Smart's Bridge does possess these essential qualifications in a super-eminent degree, and, consequently, that it is the best bridge ever invented.

The principle of its construction, and that in which its great strength seems to consist, is by the intersection of a number of triangles, assimilating it to the nature of a trussed roof, of which it is a great improvement; and its admirable and novel application to the construction of bridges, is, we conceive, a valuable acquisition in that noblest species of architecture. Being thrown across a river in a straight horizontal line, it is, unquestionably, of the most *convenient* form, and as to *beauty*, there is perhaps no other figure susceptible of so great a variety of elegant designs.

Fig. 1. represents an elevation of one half of the Bridge, being cut off midway, owing to the want of space in our page to represent the whole, by which the intersections of the bars would have been too minute to be clearly comprehended. *Figs.* 2, 3, 4, 5, are the separate bars of which the whole bridge is composed, excepting as respects the roadway. *Fig.* 2 is a "hanging-bar," thirteen of which are shewn suspended perpendicularly in their situations in *fig.* 1.—*Fig.* 3 is one of the base bars, *fig.* 4 one of the diagonal bars, which are shewn in *fig.* 1, intersecting one another at uniform angles throughout the structure.

The extraordinary simplicity and economy of this bridge is not the least of its excellencies. All the labour required upon the bars after they are received from the iron works, is simply the drilling of the holes, which should be executed with great accuracy with respect to their diameter and distance from one another; and the strength of the bars are thus preserved, which the frequent heating of them, in other works, greatly reduces, by producing flaws and cracks, or by destroying that longitudinal arrangement of the fibres which a new bar of wrought or rolled iron is found to possess.

In constructing the Bridge, the first point is to determine the angle of the diagonal supports, which the patentee recommends to be about eighteen degrees; the length of the bars which are to form the angles should not exceed twenty feet, with a width and thickness in proportion to the weight they may have to sustain. Short lengths are preferred as they allow the joints to be made with less play or openness than could be admitted in long pieces, which exposes them to destructive strains by the expansion or contraction of the metal, during changes in the temperature of the atmosphere. The base and hanging bars are likewise to be made in due proportion according to the figures 2 and 3. The connecting bolts should also be of one

uniform exact length, which is that of the width of the bridge; their office being to connect the two sides of the bridge, as well as to brace the cross bars at every intersection. In the engraving, four horizontal lines of base bars are exhibited, but that number may be increased or lessened according to the strength required in the bridge. The greater the number of base as well as diagonal bars employed the more the structure is strengthened. The floor or road-way of the bridge Mr. Smart recommends to be situated at the fourth base bar, reckoning from the bottom; but never on the lower bars, which has been a common and very erroneous practice in wooden bridges. Between the hanging bars, cross braces consisting of two light bars are bolted together and fitted to the connecting rods, which may be put up after the side framework is completed.

The several bars employed being all of different lengths, and the holes all drilled or punched in one uniform manner; none of the parts can be put in their wrong places, and the whole of the bridge may be erected without difficulty, and with great expedition. Consisting of so many pieces, and none of them being of great weight, the bridge may consequently be denominated *portable*, and one of great extent might be easily transported by an army, and put up when required in a few days.

For a timber bridge this construction is equally applicable, in which case there would be no necessity to limit the length of the pieces, as no expansion or contraction takes place in that direction in wood; and by letting in plates of iron on each side of the holes where the connecting bolts go through, a bridge might be made of vast strength, and at comparatively little expence. The principle upon which it is formed confers such a remarkable firmness and solidity to the structure, that we have no doubt it may be thrown over a greater extent of valley or river without middle piers than any other kind of bridge.* Middle piers cause an obstruction to the current of water; by the force or constant wearing of which against the piers, the superstructure is likewise endangered.

Mathematicians have, we believe, determined, that that form of arch is the best and the strongest for a bridge, that presses most perpendicularly upon the piers; and, as Mr. Smart's Bridge lies flat like a platform on the piers, it must on that score have the preference. The durability of the Bridge *as a whole* may be said (in one sense) to be perpetual, as any individual pieces may be easily removed and renewed without the least endangering its security or stability.

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* Those of our readers who may be sceptical on these points, may have their doubts removed by an inspection of the model at Mr. Smart's Saw Mills, Lambeth Marsh. We were favoured with a sight of it ourselves, and were not a little astonished to see a heavy man jump in the middle of it, and the concussion was like that of jumping upon a solid rock, there being *no apparent vibration.* The model (we speak from recollection) might be 8 or 10 feet long, with the parts in proportion, as described.

ILLUMINATING POWERS OF OIL AND COAL GAS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"MUCH has been said upon the subject of the comparative illuminating powers of oil and coal gas, but I am sorry to say that the public has derived very little light from the controversy which has arisen upon it. The discussion has assumed so much of *party* spirit that the real merits of the case I believe still remain to be shewn. The coal gas people have gone into it with much rancour, and instead of treating the question in a fair, candid, and scientific way, have terribly bespattered their unfortunate opponents with furious words and high sounding assertions. Hitherto, although they have kept up a constant fire, it has been in ambuscade; but now that they have obtained a tower of strength in the name of Professor LESLIE they desist from such skirmishing attacks, and with common consent gather their forces under his formidable banners. As the report of his experiments (made at the especial instance of the Edinburgh Gas Light Company, of which, I believe, he is a large shareholder) has not obtained a very general publicity, I beg leave to transcribe it.

"'*To the Directors of the Edinburgh Gas Light Company.*

"'Edinburgh, 19th July 1824.

"'GENTLEMEN,

"'The various discrepant accounts, and the confident 'assertions, repeated, I suspect, without due examination, concern-'ing the relative advantages of the Coal and the Oil Gas, made me 'desirous of instituting an enquiry into the subject, with more precise 'and accurate means of investigation than had been generally em-'ployed. Your invitation last Winter to make experiments on this 'important subject, prompted me to defer this research no longer; 'but as I projected several changes and modifications in the instru-'ments to be used, I could not conveniently commence the operations 'till within these few weeks. I am now engaged in the prosecution 'of an extensive series of such experiments, which promise all the 'information that could be desired.

"'Though I have had time to explore a part only of the subject, 'yet the results, however different from the common averments, are 'consistent and satisfactory, and may be deemed important. I 'therefore think it right to make a report *at this stage of the inquiry*, 'but shall confine my remarks to two points: 1st, The comparative 'Density of the Gases, and, 2d, Their relative Powers of Illumina-'tion.

"'*First*, The Density of your Coal-Gas commonly does not 'much exceed *six-tenths* of that of atmospheric air: When I began 'the operations, its density was only ·593; but it was afterwards '·618, and is now ·623. In winter I once found it to be ·680, and 'at another time as high as ·700, though it was oftener at ·600. 'The variation seldom, I presume, exceeds the *eighth* part.

"'A small quantity of Oil-Gas, procured for the Experiments, 'I found to have the specific gravity of only ·674, not greater indeed

'than that of your Coal-Gas, when made from the best Coal. The 'Oil-Gas, however, furnished by Mr. Milne, manufactured on a 'small scale, and apparently with great care, at his Works, was 'materially denser, being as high as ·943, though on a former oc- 'casion I found it to be only ·810.

"'If we assume in round numbers the density of Coal and Oil- 'Gas to be six and nine-tenths of that of atmospheric air, it is easy 'to compute, that under the pressure of half an inch of water the 'quantities discharged from the Burner No. I. of the Oil Gas, which 'contains ten holes, each having the 1-40 of an inch in diameter, 'would be respectively 4¾ and 3 8-9 cubic feet. The quantities actu- 'ally consumed, however, are only about the halves of these measures, 'because, the aperture is always contracted by partly shutting the cock 'to bring the flame to the same standard height. When the flame is 'thus regulated, I find the consumption of the same gas, and with 'the same Burner, always the same, whatever may be the load 'placed on the Gasometer. For instance, after increasing the load 'four times, and consequently doubling the velocity of discharge, 'yet on adjusting the cock so as to reduce the flame to its former 'height, the expenditure of the Gas was not altered.

"'*Second.*—The Illuminating Powers of the two Gases were '*measured* with great accuracy, by the application of my Photometer, 'which I had somewhat modified to exclude every irregular influence 'of heat. The indications were steady and easily noted, nor could 'the judgment of the observer be liable, as other cases, to any sort 'of bias or indecision. It hence appears to be ascertained, that with 'the same Burner the powers of illumination of different Gases, and 'of the same Gas in different states, are very nearly proportional to 'their densities. The same *weight* of Gas of any kind gives out 'the same quantity of light; but if equal *bulks* be taken, the illumi- 'nating powers follow the ratio of their densities. But the quantity 'of light emitted is not uniformly proportional to the measure of the 'Gas expended. A certain burner, for instance, was observed to 'produce double the illuminating effect, though it consumed only 'one-half more of either species of Gas. With No. 1. of the Oil-Gas 'Burner, the relative illumination of Mr. Milne's Oil-Gas to that of 'your Coal-Gas, was found to be as six to five. But a cubic foot 'of the former lasted thirty-eight minutes, while a cubic foot of the 'Coal-Gas was spent in thirty minutes and a half. The relative 'volumes consumed were hence in the space of an hour 1·58 and '1·97, or in the ratio of four to five. Wherefore while five cubic 'feet of Coal Gas give five degrees of light, four cubic feet of the 'best Oil-Gas give six degrees; that is, for equal volumes the illu- 'minating power of the Oil to the Coal-Gas is as *three* to *two*. The 'same conclusion was obtained on passing those several Gases suc- 'cessively through the Argand Coal-Gas burner No. 2.

"'Thus the illumination of Oil-Gas is actually less than the 'half of what has been currently asserted.

"'I have the honour to be, &c.

"Now, Sir, without going into a question of so much importance to those whom it may most concern, or into the soundness of the learned Professor's conclusions, I must be permitted to deny in toto the premises which he has assumed; and, until the result of the experiments (in so early a stage, of which it is somewhat surprising that he should hazard his opinions), which he proposes to go into shall have been publicly communicated, I shall refrain from breaking a lance with so high an authority. It will be seen that the gist of Mr. Leslie's arguments is that the illuminating power is in proportion to the *density* of the Gases, a fact which, I conceive, will admit of some dispute, and when the promised experiments are gone through the time of disputation will then more properly arrive. Of the relative values of the Gasses which he avows himself to have used I have no right to speak, but I humbly think that he has in this case hardly fought upon fair ground. His second position, that 'the illuminating powers of 'the two Gases were *measured* with *great accuracy* by my Photometer' is a formidable one, for until he declares what are the 'several 'changes and modifications in the instruments used,' we can do nothing, as it would be difficult indeed to combat with a man who is armed with invisible weapons. I have been given to understand that the Photometer employed is simply that which is well known to the world, and which however ingenious in its construction is equally well known to be acted upon by the substances of heat and light together. And surely professor Leslie does not mean to assert that the radiation of heat and light are equivalent upon his Photometer.

"As I am not a proprietor in either Oil or Coal Gas Companies, and a burner of wax and tallow only, I have little interest in the dispute beyond the ends of scientific knowledge, but I conceive the public should suspend judgment until the subject shall have had a fairer and more liberal and scientific discussion than it has yet received.

"Your's, with much respect,

"O. P. Q."

AEROSTATION.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"As the public attention has of late been a good deal directed to this subject, more especially from the fatal consequences that have recently occurred to three or four unfortunate adventurers, I trust you will excuse my calling your attention to it with a view to put a stop to a practice, which, while it promises little benefit to the world of science, seems likely to involve most awful and unnecessary danger. I certainly think that the matter calls loudly for legislative interference, for certainly human life should not be jeopardised for the idle gratification of a gaping multitude. With the exception of Mr. Sadler, I know of no one individual that has shewn himself in the slightest particulars calculated to engage in so hazardous and profitless an employment. I know of no one instance wherein science has been benefitted, and unless some such object can

be clearly shewn, I humbly think that people should not be suffered to risk their lives, and the happiness of their relatives for the sake of a pecuniary gain, or of a silly notoriety. The ignorance of some of these men is most surprising, and in one instance appeared so gross, that the adventurer was obliged to submit the process of inflation to the superintendence and direction of two gentlemen of the town from which the ascent was to be made.

" Perhaps it would not be uninteresting to state the calculations which Dr. Ure gives, as necessary to be gone into for the purposes of ascension, and I accordingly subjoin them for the information of your readers.

" After stating the decided superiority of the spheroidal shape, he gives the following table to shew the relation betwixt the diameters, surfaces, and capacities of spheres.

Diameters.	Surfaces.	Capacities.
1.....	3·141.....	0.523
2.....	12·567.....	4.188
3.....	28·274.....	14.137
4.....	50.265.....	33.51
5.....	78.54	65.45
10.....	314.159.....	523.6
15.....	706.9	1767.1
20.....	1256.6	4189.
25.....	1963.5	8181.
30.....	2827.	14137.
40.....	5026.	33510.

" ' Having ascertained by experiment the weight of a square foot ' of the varnished cloth, we find by inspection in the above table, a ' multiplier, whence we readily compute the total weight of the ' balloon. A cubic foot of atmospheric air weighs 527 gr: and a ' cubic foot of hydrogen about 40· But as the gas employed to fill ' Balloons is never pure, we must estimate its weight at something ' more: and, perhaps taking every thing into account, we shall find ' it a convenient and sufficiently precise rule for aerostation to con- ' sider every cubic foot of included gas to have by itself a buoyancy ' of fully one ounce avoirdupois. Hence a balloon of 10 feet diameter ' will have an ascensional force of fully 524 oz. or 33 lbs. *minus* the ' weight of the 314 superficial weight of cloth, and one of 30 feet ' diameter a buoyancy of fully 14,137 oz. or nearly 890 lbs. *minus* the ' weight of the 2827 feet of cloth.'

" Of course these calculations will hold equally good when any other than pure hydrogen is used. " I remain, &c.

" MI RE. OL."

SMOKE PREVENTIVE.

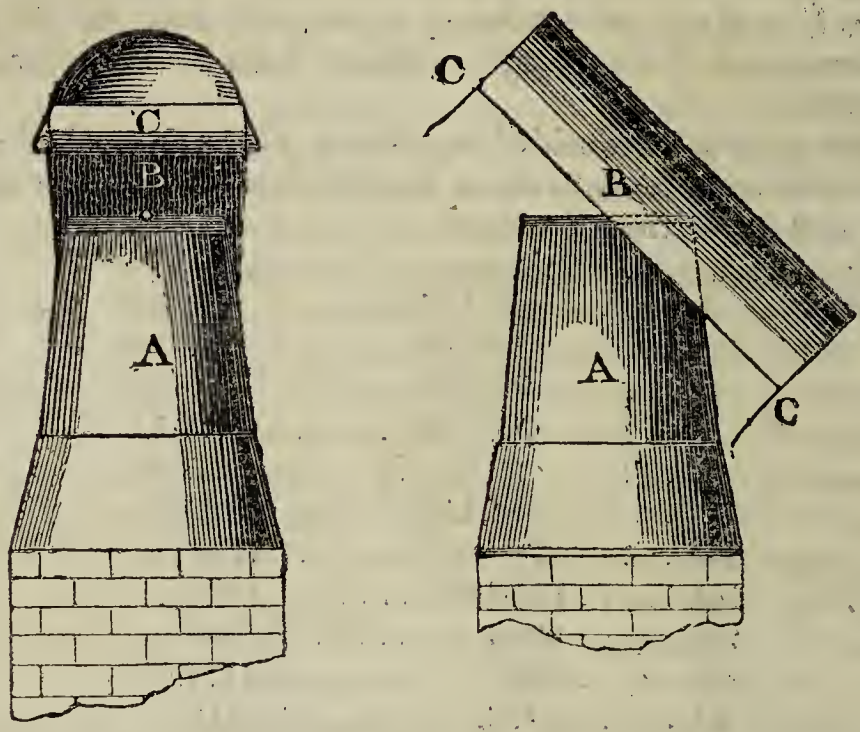
" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" I take leave to forward you a rough sketch of a plan which I conceive would go greatly to prevent the smoking of chim-

nies, and in doing so I suppose I need not dilate upon an evil so frequently experienced.

"I am but a sorry mechanical draughtsman, and am not certain that my drawing will sufficiently shew my intention. By your permission however I will endeavour to explain it, and trust that the idea may convey a hint to those who have given the subject their consideration.



"I propose that upon the chimney top *a* shall be placed a movable (half) cylinder *b*, which by means of a cross bar in the centre may move upon a pivot fixed to another cross bar upon the top of *a*, or similarly to that of an old wife; any more convenient means however can of course be adopted which appears most applicable to give it a free rotary motion. At either end of the cylinder is fixed a leaf or plate falling perpendicular to it, and cut into divisions to be partially bent or twisted in reverse ways from the middle of it. This, however, I have not shewn in the drawing. Now as *b* is to be equipoised upon the pivot it of course follows that the slightest breath of air will cause it to fall on the opposite side, and as the plate at the end is in such twisted divisions, from whatever quarter the wind proceeds *b* will be drifted with it. We will suppose that the position of *b* points due north, and that a gust of wind suddenly blows from that quarter; the wind taking the plate *c* will force down the cylinder in that direction, and the smoke arising from the chimney without being sent down will have an equally free vent to that which it had before, from out of the mouth at the opposite end.

"From the plate *c* being so divided, it is impossible that a heavy wind can wrench off the half cylinder *b*, because taking the opposing divisions it must of course be blown in a corresponding direction to it. Nor do I think that any obstruction will be caused by the fall of snow, as from its incessant motion and its diagonal position in every case, it will effectually prevent any such accumulation as would retard its operations.

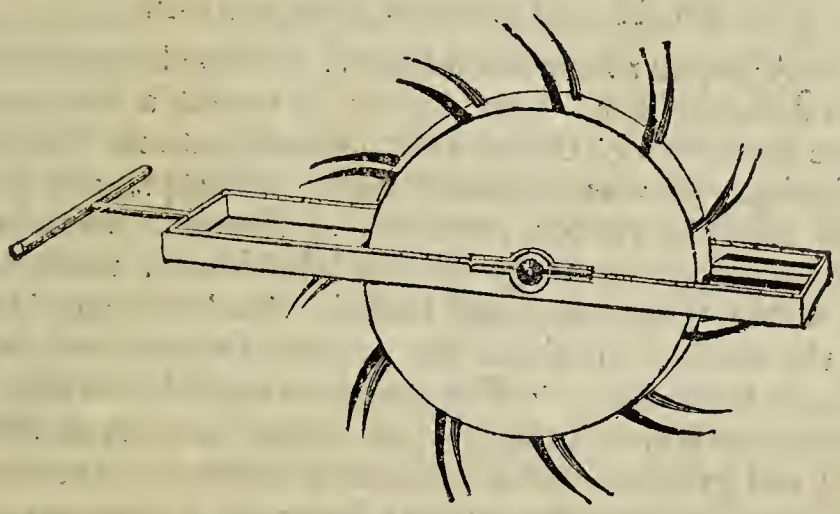
"I propose that the chimney top *a* should be connected to the square form of the brick work by as great a quantity of mortar or cement to be laid on *conically*, as can be done; in order that no eddy or irregular current of air may be produced, which must be the case as the present mode of chimney making is conducted.

"I have very fully considered this plan, and think that I should be able to meet any objections that may be made to it. I have forborne to be so explicit as I *could* be, and have chosen to give the description and sketch in its simplest possible form in order the better to shew its principle.

"I trust that this suggestion may be found a means of averting one of the most annoying concomitants of civilised society.

"And am, your very obedient,

"L. W."



THE POSSOR,

INTENDED TO SUPERSEDE THE SPADE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"SHOULD the above, with the following explanation, meet your approbation, they are much at your service; my only aim being to throw out a hint to mechanics in general, in order that those who are occupied in that branch more particularly may take up the idea, and improve upon it, as I have no doubt a very useful machine may be made on this principle.

"The figure represents a roller surrounded by two or three tiers of tines or spadles, which, as the machine is drawn along, are pressed into the earth by the machine's weight, and throw it up as it goes on. In front is a handle, to be drawn by one or two men, as the nature of the soil may require; and behind, on a bar connected with the frame by which the machine is drawn, are fixed tines, between which the tines on the roller are to work, so as to clear off the earth which may adhere to them.

"The advantages of a machine constructed on this principle will obviously arise: 1st, from the weight of the machine pressing the

tines into the earth, instead of the laborious method of thrusting down a spade with the foot. 2nd, the power of the lever will be brought into action in turning up and breaking the clods, by the roller being propelled at its axis, which may be taken for one end of the lever, while the tines on its circumference may be taken for the other end; and by the tines of the circumference passing between those on the bar behind, the earth will be completely crumbled to dust: and, lastly, in point of time, the operation will be rendered so much easier and quicker, that I do not think it extravagant to expect that a man may prepare four times as much ground in one day, as he can do with a spade.

"Yours, &c.

"T. B. GERASCON."

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. II.—*(Continued from page 46.)*

ALE.—A popular fermented liquor, obtained from an infusion of malt, and differing from beer chiefly in having a less proportion of hops.—see BREWING. Under various modifications this liquor is of great antiquity. It was originally made in Egypt, and from thence introduced into the various countries of Europe, wherein it constituted the principal beverage of the inhabitants, under the several names of Ceria, Cerivisia, and Curmi. Isodorus and Orosius thus describe the manner in which the ancient Britons and other Celtic nations made their ale: "The grain is steeped in water and made to germinate, by which its spirits are excited and set at liberty; it is then dried and grinded; after which it is infused in a certain quantity of water, which being fermented, becomes a pleasant, warming, strengthening, and intoxicating liquor." Mention is made of this liquor in the laws of Ina, King of Wessex. Various sorts of ale are known in Britain, particularly pale and brown; the former is brewed from malt but slightly dried, and the latter from malt that has been highly dried, or roasted. Hard water is considered preferable for making pale ale, and to be the most wholesome; but soft water is considered requisite to extract the soluble parts of high-dried malt. The consumption of ale in these kingdoms is almost incredible. The excise duties alone upon beer and ale amount to several millions annually, and form one of the principal sources of the revenue.

ALE, cerivisia,—a term given to a variety of medicated ales, or diet-drinks, of which ale is the basis, and forming specifics of no small importance in our old dispensatories. They were usually made by infusing peculiar medicinal herbs in the ale during the fermentation.

ALEGAR, an inferior sort of vinegar made from beer or ale; it is used by the dyers.

ALEMBIC is the name given to a machine formerly in general use for distillation, and very nearly resembling the usual form of that apparatus now called a still. In the latter the vapour which rises from the boiling liquid is collected in the capital, which is of a globular form, and from thence it rises into an arched neck, or tube,

which terminates in another vessel, where the vapour is condensed; but in the alembic the vapour is both collected and condensed in the globular head or capital, which is surrounded with cold water for that purpose, and the spirituous liquid being collected in a channel made round the lower part of the capital, is conducted off by means of a pipe. The alembic has, however, its conveniences; it is simpler than the still, and answers every purpose extremely well for many chemical purposes: but in the distillation of spirit, the alembic is almost wholly out of use, on account of the excessive tediousness of the operation, when compared with the still; more especially when stills are constructed according to the recent patent improvements described in pages 10, 149, 161, of the First Volume of this Work.

ALEMBROTH SALT, is a name given by the earlier chemists, but still retained in modern nomenclatures, to a compound salt formed by the union of the corrosive muriate of mercury with the muriate of ammonia. The ammoniacal salt remarkably increases the solubility of the mercurial, and a solution of the alembroth salt is the usual form in which that active medicine, the corrosive sublimate is administered internally.

ALGAROTH. (POWDER OF) This is an old medicinal preparation of the alchemists. Taken in doses of three or four grains it is violently purgative and emetic. Butter of antimony when thrown into water is not entirely dissolved, but a portion of the metallic oxide falls down in the form of a white powder, which is the powder of algaroth.

ALKAHEST.—The pretended universal solvent of Paracelcus and Van Helmont, who asserted that there is a certain fluid in nature capable of reducing all sublunary bodies into their original matter. Van Helmont having declared that he actually possessed the secret of the alkahest, excited succeeding chemists, who had each their particular theory or conjecture on the subject, in the pursuit of discovering so wonderful a menstruum. Even in the last century we find the learned Boerhaave actively engaged in the discovery. Kunckel, however, has very pointedly shewn the absurdity of searching for a universal solvent, by the shrewd enquiry, "if it dissolves *all* substances in what vessels can it be contained?"

ALKALI, a term derived from the Arabian; *al* signifying the, and *kali* the name of a plant, from the incinerated ashes of which is obtained, by lixiviation, one of the species of alkaline substances. The alkalies of commerce are of two kinds, the fixed and the volatile; of the former there are two species, the vegetable called potash, and the mineral called soda: the volatile alkali is called ammonia. Another mineral alkali, possessing several properties in common with soda, has been lately discovered by a young Swedish chemist, to which the name of *lithia* has been given; and a great variety of new vegetable alkalies have likewise been of late discovered by other chemists, which having been hitherto confined to the laboratory of the experimental chemist, or the medical practitioner, and not employed in any of the useful arts, we shall abstain from any further notice of them in this place. The properties which alkalies have in

common, are, 1, an acrid and pungent taste, acting so as to corrode the tongue: 2, a tendency to dissolve animal substances, and reduce them to a gelatinous state: 3, in uniting with all the acids with the power of taking the earths and metals from them: 4, the power of changing blue vegetable juices to green; the green to yellow; the yellow to orange; the orange to red; and the red to purple; 5, a propensity to unite with oils, forming the important compound soap: 6, the power of destroying almost all colours that can be put upon cloth, whence their use in bleaching, &c. Both soda and potash will endure a great heat without being dissipated, but they may be decomposed or volatilized by being exposed to the intense heat of a furnace; they are much used in the composition of glass, which see. Sir H. Davy has shewn that the bases of potash and soda are metallic, to the former of which the name potassium has been given, and to the latter that of sodium, which when combined with a certain proportion of oxygen, constitute a body having those peculiar properties which we call alkaline, and when combined with oxygen in another proportion form one of an acid nature. The volatile alkali is produced by the distillation of animal matters; it is, in its pure state, an invisible gas, and unites readily with water in a large quantity. It has never been procured in a solid form, unless combined with some other substance, nor as a liquid except by its union with water. It is of an extremely pungent smell, highly stimulates the nostrils, producing coughing and tears. For the account of the processes of procuring these important articles of commerce, see Potash, Soda, Ammonia,—and Soap.

UNIFORMITY OF WEIGHTS AND MEASURES.

In consequence of the want of uniformity in our weights and measures in general use, and the confusion and fraud resulting therefrom, an act was passed in the last session of parliament for regulating and establishing *from the 1st of May*, 1825, one certain and uniform standard, and all former acts on the same subject that are at variance with this regulation, are by the new act recited and repealed; therefore,

From the 1st of May, 1825, the standard of weights and measures are determined to be as follow, viz.

The Standard Yard is "that distance between the centres of the two points in the gold studs in the straight brass rod, now in the custody of the clerk of the House of Commons, whereon the words and figures 'Standard Yard, 1760,' are engraved, which is declared to be the genuine standard of the measure of length called a yard: and as the expansibility of the metal would cause some variation in the length of the rod in different degrees of temperature, the act determines that the brass rod in question shall be of the temperature of 62 deg. Faht. The measure is to be denominated the 'Imperial Standard Yard,' and to be *the only standard whereby all other measures of lineal extension shall be computed.* Thus the *foot*, the *inch*, the

pole, the *furlong*, and the *mile*, shall bear the same proportion to the 'Imperial Standard Yard' as they have hitherto borne to the yard measure in general use."

The act also makes provision for the restoration of the standard yard, in case of loss, destruction, or defacement, by a reference to an *invariable* natural standard, which is to be that proportion which the yard bears to the length of a pendulum, vibrating seconds of time in the latitude of London, in a vacuum at the level of the sea; which is found to be as 36 inches (the yard) to 39.1393 (the pendulum); thus a sure means is established to supply the loss which might by possibility occur.

The Standard Pound, is determined to be that standard pound *troy* weight made in the year 1758, in the custody of the clerk of the House of Commons; such weight is to be denominated the "Imperial Standard Troy Pound; and after the first of May, 1825, it is to be "*the only standard measure of weight from which all other weights shall be derived, computed, and ascertained*; and that one-twelfth part of the said troy pound shall be *an ounce*, and one-twentieth part of such ounce shall be *a pennyweight*, and that one-twenty-fourth part of such pennyweight shall be *a grain*; so that 5760 such grains shall be *a pound troy*, and 7000 such grains shall be declared to be *a pound avoirdupois*, and one-sixteenth part of the said pound avoirdupois thall be *an ounce avoirdupois*, and one sixteenth part of such ounce shall be *a dram*.

If the said standard pound shall be lost, destroyed, or defaced, the act directs that it shall be recovered by reference to the weight of a cubic inch of water; it having been ascertained that a cubic inch of distilled water, weighed in air by brass weights, at the temperature of 62 deg. Fah. and the barometer at 30 inches, is equal to 252.458 grains, and as the standard troy pound contains 5760 such grains, it is therefore established that the original standard pound may be at any time recovered by making another weight to bear the proportion just mentioned to a cubic inch of water.

The Standard Gallon is determined by the act to be such measure as shall contain ten pounds avoirdupois of distilled water, weighed in air, at the temperature of 62 deg. Fah. and the barometer at 30 inches, and such measure is declared to be the "Imperial Standard Gallon, and shall be the unit and *only standard measure of capacity to be used, as well for wine, beer, ale, spirits, and all sorts of liquids, as for dry goods not measured by heaped measure*; and that all other measures shall be taken in parts or multiples of the said imperial standard gallon—*the quart* being the fourth part of such gallon, and *the pint* one-eighth part—two such gallons making *a peck*, eight such gallons *a bushel*, and eight such bushels *a quarter* of corn, or other dry goods, not measured by heaped measure.

The Standard for heaped Measure, for such things as are commonly sold by heaped measure, such as coal, culm, lime, fish, potatoes, fruit, &c. shall be "*the aforesaid bushel*, containing eighty pounds avoirdupois of water, as aforesaid, the same being made round with a plain and even bottom, and being 19½ inches from out-

side to outside ;" and goods thus sold by heaped measure, shall be heaped " in the form of a cone, such cone to be of the height of at least six inches, and the outside of the bushel to be the extremity of the base of such cone ;" three such bushels shall be *a sack,* and twelve such sacks shall be *a chaldron.*

Stricken Measure. The last-mentioned goods may be sold either by the heaped measure, or by the standard weight as before mentioned ; but all other kind of goods not usually sold by heaped measure, which may be sold or agreed for by measure, the same standard measure shall be used, but it shall not be heaped, but stricken with a round stick, or roller, straight, and of the same diameter from end to end.

N. B. Copies and models of the standard of length, weight, and measure, are to be made and verified under the direction of the Treasury, and every county to be supplied with them for reference whenever required ; and after the 1st of May, 1825, all contracts for sale, &c. by weight or measure shall relate to the standard, unless the contrary is specified. Existing weights and measures may be used, being marked so as to show the proportion they have to the standard measures and weights. Tables of equalization of the weights to be made by the Treasury. Tables also for the Customs and Excise, by which the duties will be altered so as to make them equal to what they are at present, in consequence of the alterations in the weights and measures.

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Sulphuretted Hydrogen inflamed by Nitric Acid.—It has been remarked by Berzelius, that if a few drops of fuming nitric acid are put into a flask with four or five cubical inches of sulphuretted hydrogen, and the flask be merely closed with a finger, it soon acquires so much as to produce combustion with a beautiful flame, accompanied with a slight detonation, which raises the finger from the orifice of the flask.

Ammonia disengaged from Plants during Vegetation.—M. Chevalier has ascertained that ammonia is spontaneously disengaged in a free state from the Chenopodium Vulvaria during vegetation; and by numerous experiments that he has made in conjunction with M. Bouillay, he has determined that a great variety of flowers, and even those which possess an agreeable odour, give out ammonia in a free state during the process of vegetation. By distillation of the Chenopodium Vulvaria M. Chevalier has also obtained ammonia. —*Journal de Pharmacie.*

Chromate of Iron.—This rare mineral has been lately discovered by Sir H. Davy in small granular masses, disseminated in a greenish white marble, from Buchanan, in Stirlingshire.

Pure Hydrogen.—It has been remarked by M. Bischof, that when an amalgam of zinc is treated with a solution of potash, hy-

drogen gas is furnished of greater purity than can be obtained by any other means; and owing to the small quantity of zinc necessary to produce the effect, M. Bischof thinks that errors are likely to arise from the evolution of hydrogen during the analysis of gases over mercury, when the solution of potash is employed to absord carbonic acid gas.

Extraordinary eruption of a Column of Fire in America. A remarkable phenomenon has lately occurred on the river Calfkiller, near the salt-works, about three miles from Sparta, U. S. America. A Column of Fire forty feet in height rose from the water in the middle of the river, and extending over a space of fifty verges, illuminating objects with tints of red, blue, green, and yellow. It is conjectured to have been caused by a sudden burst of sulphuretted hydrogen which was inflamed by the approach of a lighted torch. The liberation of the gas has been attributed to the operations of the salt-mines in that district, but this explanation is very unsatisfactory. *Revue Encyclopidique.*

Preservation of engraved Copper Plates.—As many fine engraved copper plates become seriously injured by gradual oxidation, owing to their being laid by for future use, Dr. M'Cullock recommends the varnishing of the plate when laid aside, either with common lac varnish, which may be removed when requisite by spirit of wine, or caoutchouc varnish.

Snow Fleas.—Previous to a thaw, says a Canadian traveller, they are observed upon the snow in great multitudes, I once counted upwards of 1,296,000 upon a single square yard; and I think it is probable that every yard of wood-land in the province would average at least an equal number. The snow flea is perfectly black, and about the size of a grain of the finest gunpowder.

Native Oil of Laurel.—A species of laurel tree grows in the district between the rivers Parime and Oronooko, which is remarkable for yielding from incision a copious supply of native oil, resembling the essential oils obtained by artificial processes, though more volatile and highly rectified than any of them, its specific gravity hardly exceeding that of Alcohol. When pure it is colourless and transparent; its taste is warm and pungent, its odour is aromatic, and it seems to possess all the properties of oil of spirit of turpentine.

Substitution of Potatoes for Soap.—M. Cadet de Vaux proposed to wash Linen by the application of potatoes only, three parts boiled, instead of soap. The following is an experiment on this subject made by M. Heriart de Thury, the report of which signed by him has been published.

The linen experimented upon consisted of the clothes of adults and children, sheets, coverlids, table linen, towels, brewers' aprons, hospital linen, &c. The whole was first thrown into a tub to soak in water for about an hour; it was next placed in a copper of hot water from which the pieces were taken separately to be thoroughly rubbed with prepared potatoes, as is usual with soap; thus prepared, and after having been well rubbed, rolled and wrung, it was a second

time put into the copper with a quantity of prepared potatoes, and after boiling for half an hour was taken out, turned, thoroughly rubbed, wrung, and again thrown in for some minutes; it was then well rinced twice in a large quantity of water, was put into cold water to soak half an hour, afterwards into a press to drain, and then hung out to dry. The whole time occupied was about two hours and a half: the linen was perfectly clean, free from grease, and particularly white.—*Quarterly Journal of Science.*

COURT PLASTER—is simply a solution of Islinglass in water with a very small proportion of some balsam spread on black silk.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

LEATHER FOR GLOVES.—To the person who shall make known to the Society a process equal or superior to that of the French, for preparing, dyeing, and finishing skins for fine gloves, verified by actual experiment, and the communication with at least a dozen pair of gloves made from skins so prepared.—The Gold Medal, or Forty Guineas.

CHINA PAPER FOR COPPER-PLATE PRINTING.—To the person who shall communicate to the Society the best account of the process employed in China for the manufacture of paper used in England for copper-plate printing, and known by the name of India paper, together with an account of the materials from which such paper is made.—The Gold Medal, or Fifty Guineas.

IMPROVING TURNPIKE AND OTHER ROADS.—To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiment, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat, or any other mode, so as to form an even, hard, and durable carriage road.—The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

To ALEXANDER NESBITT, of Upper Thames-street, broker, in consequence of a communication made to him by William Van Houten, the younger, a foreigner residing abroad, for a process by which certain materials may be manufactured into paper or felt, or a substance nearly resembling coarse paper or felt, which material so pressed is applicable to various useful purposes. Sealed, 27th July. Six Months.

To JOHN PRICE, of Stroud, in the county of Gloucester, engineer, for his invention of certain improvements in the construction of spinning machines.—Sealed, 5th August, 1824. Six Months.

To CHARLES JEFFERIS, of Havannah Mills, silk throwster, and EDWARD DRAKEFORD, of Congleton, watch-maker, Chester, for a method of making a swift and other apparatus thereto belonging, for the purpose of winding silk and other fibrous materials.—Dated, 29th July, 1824.

TO OUR READERS AND CORRESPONDENTS.

I. P.—H. W. and M. M. are received.

A reply to Mr. W. B's. Letter is left at our Publishers.

Our other Correspondents will be attended to in our next number.

Printed for and published by GEORGE HEBERT, 88, Cheapside; to whom all Communications (post paid) for the EDITOR are to be addressed—and Sold by SHERWOOD, JONES, and Co., Paternoster Row; SIMPKIN & MARSHALL, Stationers' Hall Court; and may be had of all Booksellers in Town and Country.

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REGISTER

OF

THE ARTS AND SCIENCES.

No. 29.] SATURDAY, OCTOBER 30, 1824. [Price 3*d*.

CONTENTS.—Vaughan's Steam and Air Engine, 66,—Fleetwood's Patent Composition 67,—Gunby's Patent Substitute for Leather, 68,—Hose for Fire Engines, Density of Metals, 69,—On Clouds,—Light of the Glow-worm, 70,—Native Oil of Laurel, 71,—Palmer's Railway, Brown's Engine, Improved Syphons, 72,—Encyclopædia of the Useful Arts, 73,—Electricity—Natural Philosophy, No. 19, Optics, on Spectacles, 76,—*Miscellaneous*: Theory of Magnetism, 77,—Aurora Borealis, Red-hot Iron, Phosphorous, Stuffs, Butter, &c. Letters of Enquiry, 78, 79,—Premiums, Patents, and Correspondence, 80.

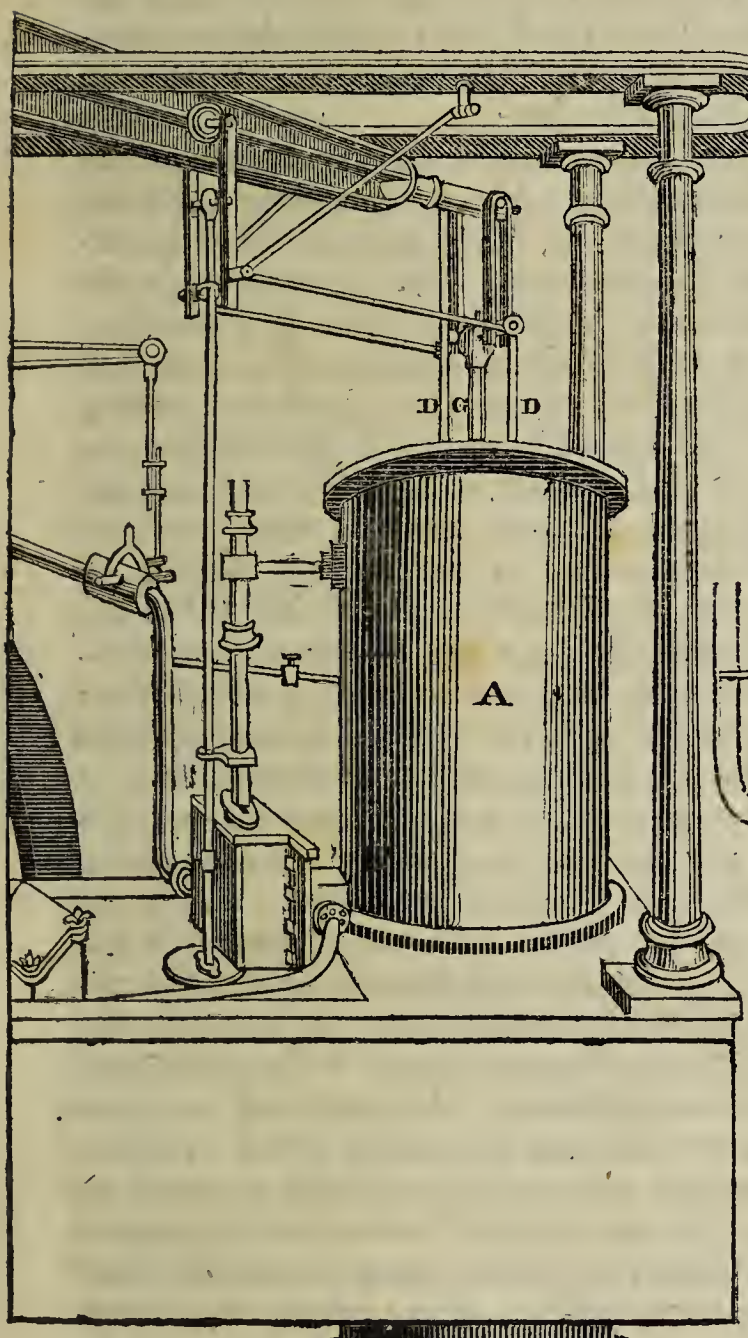


Fig. 1.

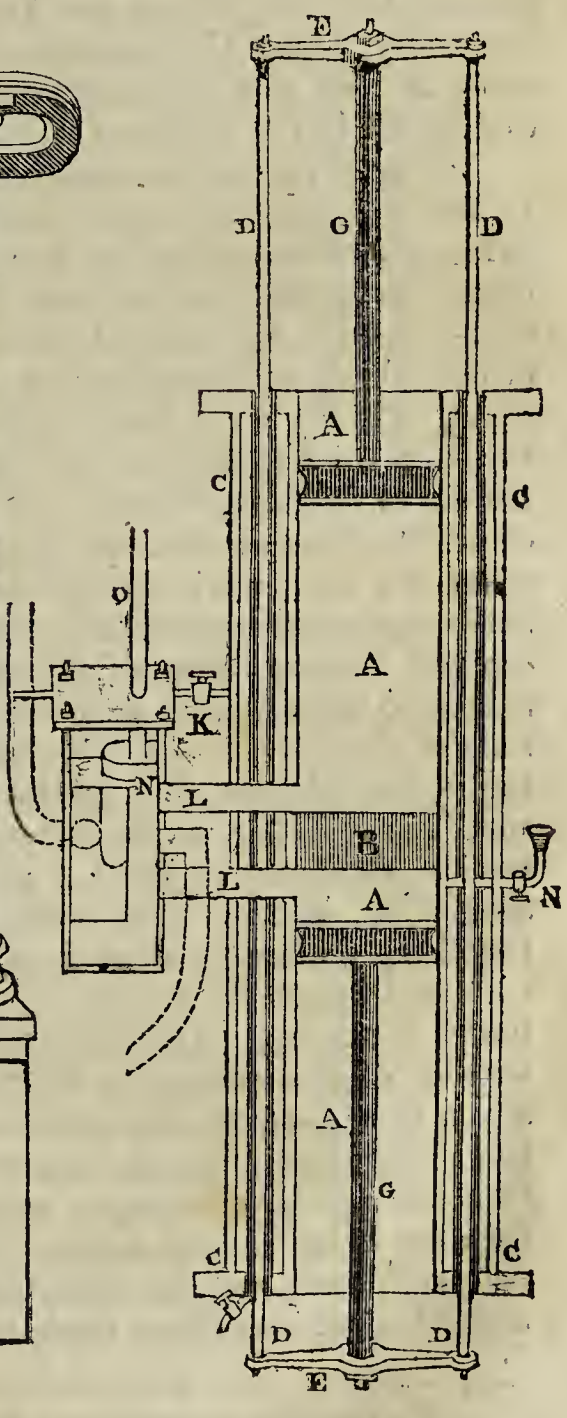
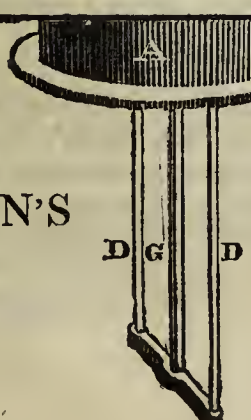


Fig. 2.



MR. VAUGHAN'S PATENT STEAM AND AIR ENGINE,

COMBINING BOTH POWERS.

Mr. VAUGHAN's PATENT STEAM AND AIR ENGINE,

Combining both Powers.

Among the numerous improvements and modifications of the Steam Engine we are disposed to believe that there are few, if any, which possess stronger claims to public notice than the new patent of Mr. Vaughan's, whether as regards its power or its economy. The invention seems to consist in the employment of atmospheric pressure in conjunction with that of steam, in such a manner that their united forces shall act at one and the same time in the cylinder; and the means by which the patentee effects this* are remarkable for ingenuity as well as a beautiful simplicity; which we shall now proceed to describe in the words of the specification:

"*Fig.* 2 represents a section of the cylinder constructed according to my improvement, or improvements. *Fig.* 1 represents the same cylinder as forming part of an engine, of which only so much is displayed as is necessary to shew its situation. *Fig.* 2, *a a a a*, is the cast-iron cylinder, open at both ends, and bored true; *b*, a partition in the middle of the cylinder *a*, which may be either cast in or bolted in afterwards; *c c c c* is a casing cast round the cylinder *a*, with a flange at the top and at the bottom, and another a little below the middle to fix the cylinder in its place, which casing is for the purpose of heating the cylinder, and keeping it hot in the usual way; two side rods, *d d d d*, work through two copper or other metal pipes fixed between the casing and the cylinder, which pipes are rivetted to the top and bottom flange of the cylinder; *e e* are two cross bars connected to the side rod at both ends, and also to the top and bottom rods of the pistons. The upper piston is represented as nearly at the top of the cylinder. The piston rod is connected to the cross bar by a socket in such bar, which bar is suspended in the links of the parallel motion, as shewn in *fig.* 1. *g g* are the two pistons and rods above alluded to, which, when connected with the cross bars, *e e*, move together, producing what I call one stroke with two pistons. *h* is a cock and funnel for conveying grease through the casing and the cylinder to the bottom piston close to the partition *b*. *i* is a cock at the bottom of the casing, to let out in the usual manner the condensed steam from between the casing and cylinder. *k* is the cock and pipe to convey steam from the steam pipe into the casing of the cylinder. *l l* represents two passages which are cast in a branch proceeding from the cylinder and casing, the one passage communicating above the partition *b*, and the other below, to convey steam in and out from under the top and above the bottom piston. *m* is a passage to convey

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* We have the best authority for stating that an eight-horse engine, constructed according to this plan was put up at Mr. Kirk's Iron Foundry at Rotherham, in Yorkshire, and that in its *effect* it exceeded the calculations of the patentee. It was put up in the short space of ten days, set to work immediately, when it made 141 strokes per minute, the pistons travelling 490 feet in the same time.

steam from under the slide valve into the condenser, which is cast in the same branch in the usual way. *n* is the slide valve inclosed in the steam box, having the steam pipe *o* connected with such box. The slide or other valve may be moved in any of the known methods employed for that purpose."—*(Patent Sealed 22nd October, 1824.)*

We believe but little need be added to shew the mode of action of this engine; we shall therefore be very brief in our observations upon that point: especially as we are rather pressed for time.

The steam being admitted through the upper passage *l* into the upper chamber of the cylinder, its piston is thereby thrown up, and the vacuum being immediately formed in the usual way, the pressure of the atmosphere of course operates instantly to thrust it down again, whilst at the same moment a corresponding effect is being produced upon the piston in the lower chamber by the steam rushing into it through the lower passage *l*, thus co-operating with the atmospheric pressure from above, in producing what the patentee calls "one stroke with two pistons." A vacuum being next formed in the lower chamber the atmospheric pressure acts upon the lower piston, while the steam, again admitted through the upper passage *l*, assists in like manner in throwing up both pistons as before, and thus by alternately allowing the steam to rush through the two passages *l l* into the upper and lower chambers, a constant uniform motion is produced and kept up.

FLEETWOOD'S PATENT WATER-PROOF COMPOSITION.

This is a new patent composition, invented by Mr. C. B. Fleetwood, of Parliament Street, Dublin, for rendering leather and other substances water-proof.

The patentee considering that all the processes heretofore known and adopted for currying leather are in a greater or less degree highly defective, but absolutely injurious to the substance of the leather, he proposes to employ instead of the animal oils heretofore used in currying, others which are less liable to putrefaction, and such as effectually resist the effects of moisture. He says, "it is an indisputable fact, that all animal substances are subject to putrify sooner than most other things; more especially, sooner than mineral productions, and even than many vegetable matters, such as gums and oils, after being chemically prepared. These considerations suggested the idea of substituting for the perishable animal matters used in the dressing of leather such imperishable substances as might be drawn from vegetable and mineral productions when treated by the chemist. In the first instance, instead of the *dubbing oil* (esteemed by the trade) and other fat animal matters, which are extremely liable to decay, and which are almost the only materials for substituting and preserving the leather, I should substitute a compound consisting of certain gums and vegetable oils." For the preparation of leather with this patent composition, the following are the proportions of the several ingredients recommended by the patentee, which he has adopted after considerable experience.

"Ten pounds of caoutchouc (or Indian rubber) are to be cut into small pieces and dissolved in twenty gallons of spirits of turpentiue, in a vessel capable of containing double the quantity, and the contents of such vessel are to be heated through the medium of a water-bath until the caoutchouc is dissolved. One hundred and fifty pounds is next to be dissolved in a similar manner in one hundred gallons of spirits of turpentine, to which is to be added twenty pounds of Burgundy pitch, and ten pounds of gum frankincense. When these two solutions are perfectly cold ten gallons of copal varnish are to be added, and the whole mixed together in a large vessel; it may then be diluted by the addition of one hundred gallons of lime water, poured in by degrees, and frequently stirred and mixed up for six or eight hours; repeating such agitation whenever any of the composition is drawn off to be bottled or casked. To give a black japan appearance to leather coated with this composition, about twenty pounds of the best lamp black is separately to be mixed up with twenty gallons of the spirit of turpentine, and then added to the rest. When the composition is thus prepared it is to be laid on and rubbed into the leather by means of a painting brush, and be well rubbed into the pores of the skin, thus rendering the leather impervious to water, and at the same time very smooth and supple."—*Patent Sealed 28th of February*, 1824.

GUNBY'S PATENT SUBSTITUTE FOR LEATHER.

This invention consists in the application of an elastic coating and varnish to substances of a pliable nature, such as all kinds of cloth whether cotton, linen, woollen or felt.

When the material is to have flexibility, the composition is to be made of the following ingredients:

Common glue size, ...	four parts,
Boiled linseed oil, ...	two parts,
Lamp black.....	half a part,
White lead, ground fine	one part,
Pipe clay, do.	one part,

These are to be melted and blended together (in a vessel of greater capacity than is sufficient to contain the whole) over a fire. At first the size is to be melted, then the oil is to be added in small quantities at a time, next the lamp black, white lead and pipe clay, during which it should be continually stirred and mixed up—the composition is then complete.

The cloth being previously strained upon frames the composition is spread on it *evenly and smoothly* with a pallet-knife, working it well therewith into the interstices of the cloth, so that it shall be throughout saturated with the composition. This first coat is then to be dried either in the air or in a warm room by hanging up the frames, care being taken that they are not exposed to much heat, which is very essential. When thoroughly dry and hard, a second may be laid on and dried in a similar way, also a third, a fourth, or a fifth (if required of great substance),—which should all be spread

on as smoothly and as thinly as possible, and every successive coat be hard before the next is laid on.

As the Patentee proposes to employ this substance, (which will resemble japanned leather) chiefly for the manufacture of patten ties; he proposes to cut the japanned cloth into strips previous to varnishing it, and to pass them between rollers to give them a smooth even surface. Some drying linseed oil or other suitable varnish is then to be brushed over it, into which any required colour may be mixed to give the desired tent. The next operation is the cutting up the material into the usual sizes for patten ties, and finishing the same as usual under a screw or die press.

For coach tops, and other purposes where flexibility is not necessary, the quantities of the pipe clay, white lead, and size may be increased, according to the nature and use of the article to be manufactured of it. For polishing and smoothening-down the inequalities of such large pieces of this material as will not pass through the roller-press the common method of rubbing with pumice-stone, tripoli, crocus martis, &c. is adopted, previous to varnishing.—*Patent Sealed 28th February*, 1824.

HOSE FOR FIRE ENGINES.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IN consequence of seeing in your very valuable publication that a Premium is offered by the Society of Arts, for an improvement on the Hose for the use of Fire Engines, *similar to those used on the Continent*, I have been engaged in experiments upon the material of hemp, which promises, I think, to be far superior to leather, both as regards expense and utility, inasmuch as that they can be made of any length and bore, without adopting the common method of junction. I should, however, be highly gratified if you, or some one of your correspondents would give a description of what is now in use on the Continent, as I am ignorant on this point, and would wish for information before proceeding further.

"*Oct. 9th*, 1824. "I remain, Yours, &c.

"A SEARCHER AFTER KNOWLEDGE."

DENSITY OF METALS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IT is stated that a circumstance was observed by Mr. Hatchett to influence the density of metals which *a priori* might be thought unimportant. When a bar of gold was cast in a *vertical* position, the density of the metal at the lower end of the bar was greater than that of the top, in the proportion of 17,364 to 17,035. I will feel much obliged if any of your scientific correspondents would

explain the reason of this; and by so doing they would very much oblige,

" Sir, your's, &c.

" *October, 4th* 1824. " J. A—N."

ON CLOUDS.

" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" As it may not be unamusing to your readers to be informed of the arrangement of the different description of clouds, to the classification of which Mr. Luke Howard was the first who directed his attention, I send you the enclosed account, and I think it would be very interesting if any of your readers would give a more detailed description of their nature and peculiarities.

" *Gray's Inn,* " I am, &c.

" 18*th October,* 1284. " A Constant Reader."

" ' The simple modifications are thus named and defined: ' 1. *Cirrus.* Parallel, flexuous, or diverging fibres, extensible in ' any or in all directions: 2. *Cumulus.* Convex or conical heaps, in- ' creasing upwards from a horizontal base. 3. *Stratus.* A widely ' extended continuous horizontal sheet increasing from below.

" ' The *intermediate* modifications which require to be noticed ' are: 4. *Cirro Cumulus.* Small well-defined roundish masses, in ' close horizontal arrangement. 5. *Cirro Stratus.* Horizontal, or ' slightly inclined masses attenuated towards a part or the whole of ' their circumference, bent downward, or undulated, separate, or in ' groups, consisting of small clouds having these characters.

" ' The *compound* modifications are: 6. *Cumulo-stratus.* The ' cirro stratus blended with the cumulus, and either appearing inter- ' mixed with the heaps of the latter, or superadding a wide-spread ' structure to its base.

" ' 7. *Cumulo-cirro-stratus,* vel *Nimbus.* The rain cloud. A ' cloud or system of clouds from which rain is falling. It is a horizon- ' tal sheet, above which the cirrus spreads while the cumulus enters ' it laterally and from beneath.' "

THE LIGHT OF THE GLOW-WORM.

" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" The Letter of O. P. Q. on the subject of illuminating powers, induces one to ask information from some of your readers upon a matter that has often occurred to my mind. I would wish to ascertain if any portion of *heat* is given out with the *light* of a Glow-Worm, and from what cause the light is produced; if it proceeded from the act of combustion, that insect would (as some writer has said), ' soon be the victim of the liberated coloric, a temperature being necessarily induced which is incompatible with life.' Should this meet the eye of any of your correspondents who could give any explanation upon the subject I should feel really obliged.

" *Maidstone, October 25th.* " ANN STACEY."

NATIVE OIL OF LAUREL.

An account of this extraordinary vegetable production, a knowledge of which has been almost exclusively confined to the inhabitants of Spanish Guiana, was drawn up by C. S. Parker, Esq. of Glasgow, upon a late visit to Demerara by that gentleman, assisted by Dr. Hancock, a physician of the colony, and was inserted in the Colonist Demerara Newspaper, 18th January, 1824; from which we make the following extracts :—

"This substance, which has very injudiciously been termed Azeytoyde Sassafras, (an appellation which tends to confound it with the essential oil yielded by the Laurus Sassafras, of the northern continent of America) affords so far as my knowledge extends, a solitary instance of a perfect volatile liquid without the aid of art. Substituting for the appellation to which I have objected the provisional name of the '*Native Oil of Laurel*,' I shall then describe the method of procuring it, and enumerate its principal chemical and medicinal properties, as far as these have been investigated and examined.

"The Native Oil is yielded by a tree of considerable height; its wood is aromatic, compact in its texture, and of a brownish colour, and its roots abound with essential oil.

"This tree which is found in the vast forests that cover the flat and fertile regions between the Oronooko and the Parime, has, from an analogy already alluded to, been supposed to belong to the natural order *Laurineæ;* and though Humboldt and Bonpland do not seem to have been acquainted with its singular and important produce, its botanical characters may very possibly have been described in their *Nova Genera et Species Plantarum Americæ Septrionalis,* under the genera Ocotea, Persea, or Litsea."

"The Native Oil of Laurel is procured by striking with an axe the proper vessels in the internal layers of the bark; while a calabash is held to receive the fluid, which gushes out in such abundance, that several quarts may be caught from a single incision, if the operation be performed with dexterity. So obscure however are the indications of these reservoirs, that the Indians (with perhaps a little of their usual exaggeration) assert, that a person unacquainted with the art may hew down a hundred trees without collecting a drop of the precious fluid. In many of its properties the native oil resembles the essential oil obtained by expression, distillation, and other artificial processes : it is, however, more volatile and highly rectified than any of them, its specific gravity hardly exceeding that of alcohol. When pure it is colourless and transparent; its taste is warm and pungent; its odour aromatic, and closely allied to that of the oily and resinous juice of the conifera.* It is volatile, and evaporates without residuum at the ordinary atmospheric temperature. It is inflammable, and, except when mixed with alcohol, gives out in its combustion a dense smoke. Neither the acids nor the alkalies seem to exert any sensible

* So striking is this resemblance, that a friend, to whose inspection I submitted the oil, pronounced it, rather hastily, to be spirit of turpentine.

action upon the Native Oil: when combined, however, with sulphuric acid, the mixture assumes a momentary brownish tinge, but soon regains its transparency: The Oil of Laurel dissolves camphor, caoutchouc, wax, and resins; and readily combines with volatile and fixed oils. It is insoluble in water; soluble in alcohol and ether. Though the specific gravity of the oil greatly exceeds that of ether, the compound formed by combining them in the proportion of one part of the former to two of the latter floats upon the surface of pure ether, and may therefore be the lightest of all known fluids.

"With repect to the medicinal properties of the *Native Oil*, it bears, when externally applied, the character of a powerful discutient, and appears, when exhibited internally, to be diaphoretic, diuretic, and resolvant: by many it is believed to be analeptic, alterative, and anodyne; and to promote the exfoliation of carious bones."

Its efficacy has been demonstrated in rheumatism, and in various disorders supposed to originate in a vitiated state of the blood: and the employment of it externally has likewise been attended with the happiest effects in paralytic disorders; also in rheumatic head ache, sprains, and bruises. "To the chemist and the vegetable physiologist in particular, the *Native Oil of Laurel*, elaborated by the unassisted hand of nature, in a state of purity which the operose processes of art may equal but cannot surpass, presents an interesting subject of enquiry, and a wide field of speculation."

"*Rue de Richelieu*, 16*th September*, 1824.

PALMER'S RAILWAY,—BROWN'S ENGINE,—IMPROVED SYPHONS.

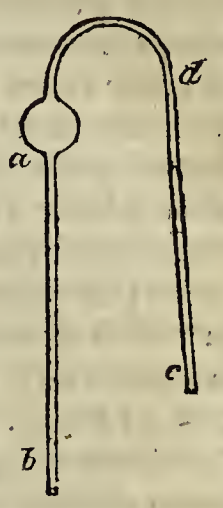
[Extracts of a Letter.]

"*To the Editor of the Register of the Arts and Sciences, &c.*

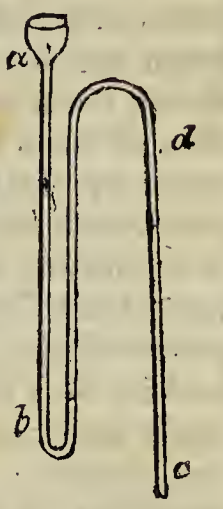
"Your First Volume of the Register has excited a good deal of interest in our circle, particularly with regard to the accounts of Palmer's Railway, and Brown's Engine. Upon the first we have *unanimously resolved* that it possesses superior advantages in most situations, that the friction must be full one third less than on other railways, and that it is best adapted for any great public undertaking for the conveyance of goods and passengers. As regards Brown's Engine there still exists so much discussion, that we have not yet come to the vote as to its superiority over the steam engine; but it is very remarkable, that the advocates for the gas engine in our *sequelle* are all French, who are (as usual) quite *ravi*'d with the invention. The English, on the contrary, are great sticklers for steam. We have been looking for some more information respecting this very curious machine, especially as to the economy in working it, but if, as the chemists say here, that water may be decomposed, and its hydrogen extricated by a very cheap process; then, indeed, the question of *expence* goes to the tomb of all the capulets. We look with anxiety for full information on these points."

——"In looking over the 'Journal de Pharmacie' the other day, I observed an account of two newly-invented SYPHONS, which you will perhaps think worthy of notice to the good folks over the water. I therefore annex a sketch and description of them.

"*Bunten's Syphon.*—A bulb is situated at *a* in the long branch *a b; c d* is the short branch. The advantage of this syphon is, that it does not require the air to be withdrawn by suction, nor to be blown into; all that is necessary is to fill the long branch, *a b,* with the liquid, as well as the ball *a,* and to immerse the short branch, *c d,* in the liquid to be drawn off. In discharging itself the bulb *a* draws off the liquid in contact contained in the shot branch, and continues to flow, notwithstanding the bulb is only filled in part, until all the liquid is decanted.



"*Hempel's Syphon.*—In this a portion of the liquid is first poured into the funnel at the top of the tube, *a b,* which is made of a separate piece, and fitted into the tube *c d;* the flow having taken place through the tube *c d,* the tube, *a b,* is separated, and the flow continues till the whole is decanted. For large syphons the preference is given to this form, being more easily made. Their advantages in other respects are equal."



ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. III.—*(Continued from page 60.)*

ALLEGEAS, a species of cloth manufactured in the East Indies from a variety of herbs, the fibres of which are spun like flax.

ALLOY, or ALLAY, a portion of baser metal mixed with a finer or more valuable one. Thus all gold coin have an alloy of both silver and copper, and silver coin an alloy of copper alone. For what is termed "standard gold" the proportion of alloy is two carats to a pound troy of gold, or one-twelfth part. For "standard silver" the alloy is eighteen pennyweights to one pound of silver. "Fine gold" and "fine silver" are terms used to denote the metal in its pure unalloyed state. The object of making use of an alloy in coins is to give them a due degree of hardness.

Chemists have availed themselves of the term, alloy, to distinguish metallic compounds in general; thus brass is called an alloy of copper and zinc; and bell-metal an alloy of copper and tin. When mercury is one of the component metals, the alloy is called an amalgam. Thus we have an amalgam of gold, of silver, of tin, &c. All metals except

mercury are naturally in a solid state at a common temperature; hence one of them at least must be melted in order to form an union; they then unite like all bodies that reciprocally dissolve each other; and from these combinations new compounds result, which have the mixed properties of the component substances. In these metallic alloys it sometimes happens that the result is only intimate mixture, in other cases a chemical combination takes place. Some metals have so little affinity for each other that no compound has as yet been effected with them. It is obvious that two bodies will not combine unless their reciprocal attraction be stronger than the cohesive attraction of their individual particles; and heat is necessary to overcome this cohesion and render their affinity more predominant. Alloys in which the component metals are fusible at different temperatures are generally malleable when cold, but brittle when hot, as in the case of brass.

Some alloys are of greater and others of a less density than the mean density of the component metals, causing thereby an augmentation or a diminution of their volume. Alloys that contain a volatile metal may be decomposed partially or wholly by the application of a strong heat, such as those containing arsenic, mercury, zinc, &c. An alloy of two metals of different fusibility may frequently be decomposed by the application of sufficient heat to melt one of them, in which case the operation is called aliquation, and is usually practised in separating silver from copper. The argentiferous copper is first melted with three and a half times its weight of lead, which by superior affinity leaves the copper and combines with the lead, and the lead is, by a subsequent operation, separated from the silver. Sometimes two metals require the intervention of a third to produce a combination: thus, in order to combine mercury with iron, the iron must first be united with tin or zinc.

When an alloy melts at a lower temperature than its component metals separately, a chemical change is considered to have taken place, and the alloy is perfect. Iron when alloyed with gold acquires almost the fusibility of the latter. Some alloys will melt at a lower temperature than either of its components; as happens with the common solder made by tin and lead; and an alloy of tin, bismuth, and lead will melt in boiling water, which is a less heat than is necessary for the liquefaction even of bismuth, the most fusible of the three. The tenacity of alloys is generally, though not always, inferior to the mean of the separate metals: thus, one part of lead will destroy the compactness and tenacity of a thousand of gold; but, brass made with a small proportion of zinc to the copper is more ductile than the copper itself. When one-third or a large proportion of zinc is used the result is a very brittle compound.

ALMOND, the fruit of the almond-tree, of which there are two principal varieties, viz. the sweet and the bitter. There is no apparent difference in the fruit to the eye except with regard to the size, and it is said that the same trees which produced bitter almonds in the wild state, have, when cultivated, produced the sweet kind; and that the sweet will afterwards degenerate into the bitter if the culti-

vation is neglected. Sweet almonds are usually blanched before exposed to sale, and the operation consists in steeping them in hot water till the skins are so soft as to be easily pealed off. They are considered very nutritious, but difficult of digestion unless well masticated. They consist chiefly of an oil of the nature of fat oils, together with farinaceous matter. The oil is plentiful and easily obtained by simple pressure. Murray says that five and a half pounds of pealed almonds have yielded, by cold expression, one pound six ounces of oil; and afterwards by heating the residue, three quarters of a pound more have been obtained. The oil of almonds being more agreeable to the palate than other oils, it is preferred for medicinal use internally, to obtund acrid juices, to soften and relax the solids, in tickling coughs, hoarseness, costiveness, &c. The milky solutions of almonds in watery liquors, usually called emulsions, are employed for the same purposes, and on account of their analogy to animal milk they are used as substitutes for it. Acids mixed with emulsions separate the oily and serous parts, and produce a thick curd, as in milk. Several substances not of themselves miscible in water, may be mixed with it by trituration with almonds, in the proportion of about six times their quantity, and be thus fitted for medicinal use as camphor, various resins and unctuous substances. The Jordan are the larger and dearer kind of sweet almonds, and are chiefly sold to be eaten with raisins. Valencia and Barbary almonds are those from which the oil is generally obtained. Bitter almonds are found to contain a poison, caution is therefore requisite in the quantity taken internally; notwithstanding they are stated to be very serviceable in obstinate intermittents. Bergius says that he has seen intermittent fevers frequently cured by the bitter emulsion alone, after having entirely resisted the decoction of bark.

The kernels of bitter almonds give the same flavour in distillation as the kernel of the cherry; on which account they are used in making a counterfeit cherry brandy. They are also used in making ratafia instead of the kernels of apricots.

ALOES.—A bitter juice extracted from the leaves of a plant of the same name; the greater part is prepared at Morviedro in Spain. Incisions are made in the leaves from which the juice is suffered to flow, which is afterwards inspissated in the sun to the consistence of an extract; this kind is called *socotrine* aloes, and is the clearest and most transparent, as well as the highest in esteem and value. A further quantity is obtained by pressure of the leaves, which is called *hepatic* aloes. A third and inferior kind is prepared from the dregs of the two former, and is called *caballine* aloes. Aloes are generally employed as a purgative medicine.

(To be continued.)

ELECTRICITY DISCRIMINATED BY ITS TASTE.—M. Berzelius has ascertained, that a current of positive electricity, passed by means of a metallic point on to the tongue, excites thereon an acid taste; but a similar current of negative electricity, produced a caustic and alkaline taste.—*Monthly Magazine.*

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 19.—Optics.

(Continued from page 48, Vol. 2.)

Of Spectacles.

As it has been before explained if objects are seen through a perfectly flat glass, the rays of light pass through it from them to the eye in a straight direction, and parallel to each other; and consequently the objects appear very little either diminished or enlarged, that is to say, nearer or farther off than to the naked eye; but if the glass through which they are seen have any degree of convexity, the rays of light are directed from the circumference towards the centre in an angle proportional to the convexity of the glass, and meet in a point at a greater or lesser distance from the glass, as it is more or less convex. The point, where the rays thus meet, is called the focus: and this focus is nearer or farther off according to the convexity of the glass; for as a little convexity throws it to a considerable distance, so when the convexity is much, the focus is very near. Its magnifying power is also in the same proportion to the convexity; for as a flat glass scarcely magnifies at all, the less a glass departs from flatness, the less of course must it magnify; and the more it approaches towards a globular figure, the nearer its focus is and the more must be its magnifying power.

Different length of sight depends on the same principle, and arises from more or less convexity of the *cornea* and crystalline humour of the eye, the rounder these are, the nearer will be the focus or point of meeting rays, and the nearer an object must be brought to be well seen. The case of short-sighted people is only an over-roundness of the eye, which makes a very near focus: and that of old people is but a sinking or flattening of the eye, whereby the focus is thrown to a great distance; so that the former may properly be called eyes of too short and the latter eyes of too long a focus. Hence too the remedy for the last is a convex glass, to supply the want of convexity in the eye itself, and brings the rays to a shorter focus; whereas a concave glass is needful for the first to scatter the rays, and prevent their coming to a point too soon. Nothing is more common, than to observe old people holding objects they would examine, at a great distance from them, for the reason above-mentioned: and every body knows, short-sighted people cannot distinguish any thing without bringing it very near their eyes. Both extremes are very inconvenient; but those whose eyes are flat by age, should remember with satisfaction that they have enjoyed the pleasure of them for many years, and the short-sighted may comfort themselves, that they can distinguish much smaller objects than long-sighted people; for the object is magnified in proportion to the roundness of the eye and the nearness of the focus, and consequently appears four times as big to an eye whose focus is but four inches off, as it does to one whose focal distance is at eight inches. Short-sighted people have also this farther advantage, that age improves their sight by

the same means that it impairs other people's, that is, by making them more flat. The nearer any object can be brought to the eye the larger will be the angle under which it appears and the more it will be magnified. Now, as that distance from the naked eye, where the generality of people are supposed to see small objects best, is at about six inches; the consequence is that when such objects are brought nearer than six inches, they will become less distinct; and if to four, or three, they will scarce be seen at all. But by the help of convex glasses, we are enabled to view things clearly at much shorter distances than these; for the nature of a convex lens is to render an object distinctly visible to the eye at the distance of its focus; wherefore, the smaller a lens is and the more its convexity, the nearer is its focus, and the greater must be its magnifying power. When glasses are put in frames for spectacles, their frames ought not to be straight, so as both eyes may be as the same plane; but they ought to be so bent in the middle, that the axis of glasses may be directed to one point at such a distance. By such means the eyes will fall perpendicularly upon both glasses, and cause the object to appear distinct. But if they fall obliquely upon the glasses it will produce a confused appearance in the objects.

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

The Mathematical Theory of Magnetism has been elaborately investigated by M. Poisson, in a memoir read before the Parisian Academy, analogously to the theory of electricity, which refers the phenomena to a *positive* and a *negative* fluid; M. P. attributes the attractions and repulsions of magnetic substances to two imponderable fluids, a *boreal* and an *austral* fluid, acting in the inverse proportion of the squares of the distances; and has thereby deduced formulae of very general application, such as when applied to Mr. Barlow's important experiments, bring out his results with surprising exactness: except regarding the inference of that philosopher, as to there being *a plane of no attraction* crossing the centre of every magnetic needle perpendicularly to the line of the dip; whereas, the attractions in this plane merely decrease so much, as not to have been readily measurable in Mr. Barlow's.

One of the most curious of M. Poisson's results is, that *a magnetic needle placed in the interior of a hollow sphere of soft iron,* and so small as not to exert any sensible influence in the sphere, *will not exhibit any polarity* from the effect of the earth's magnetism, or from that of any other magnets placed without the hollow sphere.

That *the magnetizing of a steel bar increases its power of conducting electricity*, has been discovered by Mr. Abraham, and hence he recommends, that *conducting rods for lightning* should be magnetized previous to their erection.

Mr. S. A. Christie has ascertained; that *as the temperature of a magnetized steel-bar is increased, its intensity is diminished, and vice versâ;* his experiments, communicated to the Royal Society, range

from 3° of Far. to 127°, from 80° the intensity decreased rapidly as the temperature increased, and at above 100° a portion of the power of the magnet was permanently destroyed.—*Monthly Mag.*

Aurora Borealis.—The upper atmosphere seems to be composed of a large proportion of hydrogen, a fluid of so much less specific gravity than any other, that it must naturally ascend to the highest place, where being occasionally set on fire by electricity, it appears to be the cause of the aurora borealis and fire-balls. It may easily be understood, that this will only happen on the confines of the respective masses of common atmospherical air, and of the inflammable air; that the combustion will extend progressively, though rapidly, in flashings from the place where it commences, and that when by any means a stream of inflammable air in its progress towards the upper atmosphere, is set on fire at one end, its ignition may be much more rapid than what happens higher up where oxygen is wanting, and at the same time more definite in its figure and progression, so as to form the appearance of a fire-ball.

Imitation of the Aurora Borealis.—Le Chevalier de Nobili, of Modena, in some recent electro-magnetic experiments produced a very close resemblance to the Aurora Borealis, which he performed in the following manner. He took a large metallic wire, covered with silk, and coiled it up so as to form a spiral plate, having twenty-four turns, the wire of each turn being always in contact with those next to it. When a weak electrical discharge is made to pass through this spiral plate, a light is seen to proceed from the centre of all these spires which much resemble artificial fire, and is very distinctly visible without darkening the chamber wherein the experiment was made.

Red-hot Iron.—If a bar of iron brought to a red heat be plunged into a mixture of the white of egg and water, it will neither lose its glow as when put in water only, nor hiss and raise steam, because the egg is sooner coagulated than the water is boiled.

Phosphorus.—When a piece of Phosphorus of the size of a pin-head is wiped (upon blotting paper) and put into the middle of a piece of dry cotton, the cotton will by the blow of a hammer be instantly set on fire.

To give Stuffs a beautiful Lustre.—To eight pounds of stuff allow a quarter of a pound of linseed; boil it half an hour, it must be then strained through a cloth, and remain till it is almost a jelly; afterwards dissolve an ounce and a half of gum; then mix the liquor, and after pulling in the cloth, dry it in the shade, and press it. If once doing is not sufficient repeat the operation.

Butter, the oily inflammable part of milk is preserved by the addition of salt which will keep it good a considerable time if in sufficient quantity. Mr. Eaton informs us in his Survey of the Turkish Empire, that most of the butter used at Constantinople is brought from the Crimea, and Kirban, and that it is kept sweet by melting it while fresh over a very slow fire, and removing the scum as it rises. He adds, that by melting butter in the Tartarian manner and

then salting it in ours, he kept it good and fine tasted for two years, and that this melting, if carefully done, injures neither the taste nor colour.

ATOMIC OR PROPORTIONAL WEIGHTS.—Dr. Thompson gives the following as the most correct expression of the atomic weights of the substances mentioned according to his last experiment:

Boracic acid	3.00
Tartaric acid	8.25
Fluoric acid	1.25
Fluoboric acid	4.25
Tartaric acid (crystallised)	9.375
Oxygen being	1.00

the crystals of tartaric acid contain one proportional of water.—*Ann. Phil.*

LETTERS OF ENQUIRY.

From "W. B. Jun.—"

On Bone Turning.—1. what Bones are best for this purpose? 2. The best method of cleansing and whitening them? 3. Do they require any, and what softening.

From a "CONSTANT READER."

The best method of effacing *grease spots* from paper without injury to its texture or appearance.

From "A FRIEND AND ADMIRER."

As to the practicability of placing a *conductor* to a house *in a street in London,* without endangering by the attraction of the electric fluid, the safety of the houses contiguous, and if there be any persons, and whom, in the habits of undertaking the erection of such conductors.

From "A. X."

The best method and material to be employed in the construction of a Balloon of 10 feet in diameter.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

OLIVE OIL.—To the person who shall in the years 1825, 6, & 7, manufacture and import the finest specimen of oil, not less than ten gallons, the produce of olives grown in any British colony in Africa, or New South Wales.—The Gold Medal. For the next greatest quantity, the Silver Medal.

COCOA-NUT OIL.—To the person who shall import in the year 1824, the largest quantity of cocoa-nut oil, not less than fifty tons, and of the best quality.—The Gold Medal, or Thirty Guineas.

This premium is proposed, particularly with a view to encourage the use of cocoa-nut oil in the making of gas for the purpose of illumination, such gas having been found much superior to the gases commonly in use.

FINE WOOL FROM NEW SOUTH WALES.—To the person who shall produce to the Society the finest sample of wool, the produce of New South Wales, equal to the best Saxon.—The Gold Medal.

CACHEMERE WOOL.—To the person who shall import the greatest quantity of real Cachemere wool, not less than one hundred weight, freed from the hair, and in a state fit for spinning.—The Gold Medal.

CACHEMERE SHAWL GOAT.—To the person who shall have imported into the United Kingdom, subsequent to the 1st. January, 1824, the greatest number, not fewer than three females and two males, of the real Cachemere Shawl Goat.—The Gold Medal.

This premium is offered also for the year 1825 and 1826.

RECENT PATENTS.

To J. VALLANCE, of Brighton, for his improved method of abstracting, or carrying off the carolic of fluidity from any congealing water, or it may be any other liquids. Also an improved method of producing intense cold. Also a method of applying this invention so as to make it available to purposes with reference to temperatures about or below the freezing point, may be rendered productive of advantageous effects, whether medical, chemical, or mechanical. 28th August, 1824.

To JOHN SHAW, of Milltown, Glossop, Derbyshire, farmer; for transverse spring slides for trumpets, trombones, French horns, bugles, and every other musical instrument of the like nature.—Dated October 7, 1824.

To PHILLIP CHELL, of Earl's Court, Kensington, Middlesex, Esq. for improvements on machinery for drawing, roving, and spinning flax, wool, waste silk, or other fibrous substances. Dated October 14th, 1824.

To WILLIAM PHILLIP WEISE, of Tooley Street, Surrey, manufacturer, for certain improvements in the preparing of, and making water-proof cloth, and other material, for the manufacturing hats, bonnets, and caps, and wearing apparel, and in manufacturing the same therefrom.—Dated October 14th, 1824.

To HENRY MARRIOTT, of Fleet-street, ironmonger, for an improvement on water-closets. October 14th, 1824.

HENRY MAUDSLAY and JOSHUA FIELD, both of Lambeth, Surrey, engineers, for a method and apparatus for continually changing the water used in boilers for generating steam, particularly applicable to the boilers of steam-vessels making long voyages, by preventing the deposition of salt or other substances contained in the water, at the same time retaining the heat, saving fuel, and rendering the boiler more lasting.—Dated October 14, 1824.

TO OUR READERS AND CORRESPONDENTS.

JOHN WOLRAB has *not* anticipated us in the idea that has occurred to him. We have had it in contemplation to adopt the plan he proposes as soon as we are able to dispose of some little arrears, and we hope to do no at so very distant period.

SHIRAJ shall have proper attention.

Ditto NINUS.

J. X. could not, we think, have read our last number when his letter was written.

A full description of the machine alluded to by S. N. will, we hope, appear in our next.

Mr. Jackson's letter has been received, but we cannot this week give to it that consideration which it appears to deserve.

The subject of ALEXANDER's communication is too much of a *literary* nature for such a work as the Register.

Will Y. Y. be so good as *explain* more fully what he means, we shall be most happy to afford him every assistance in our power.

We do not forget our old friend J. he shall hear from us soon.

We have received Letters from the following signatures, but they are too late for this week's particular notice:—THE GHOST OF WATT.—S. T.—Mr. BLANCKENHAGEN.—A. A. J.—J. Fordyce.—A constant reader.—B. U.—W. C—e.—P. B.—J. B.—Geoffry the younger.—L.—H. D—n.—Litmus.—and F. D.—

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OF

THE ARTS AND SCIENCES.

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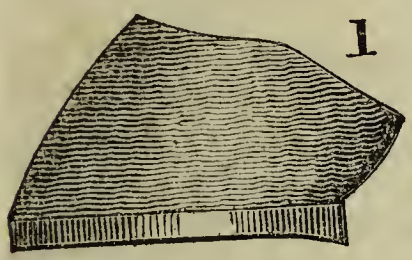
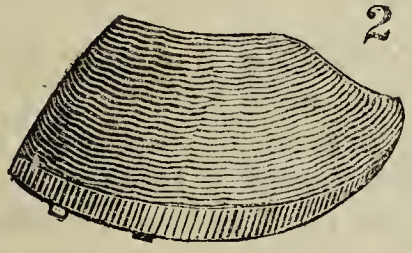
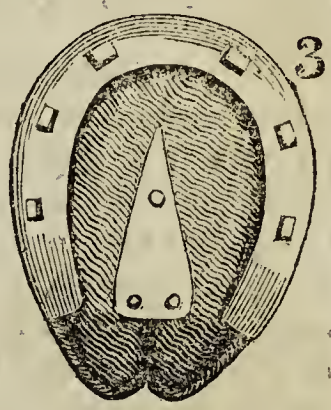
CONTENTS:

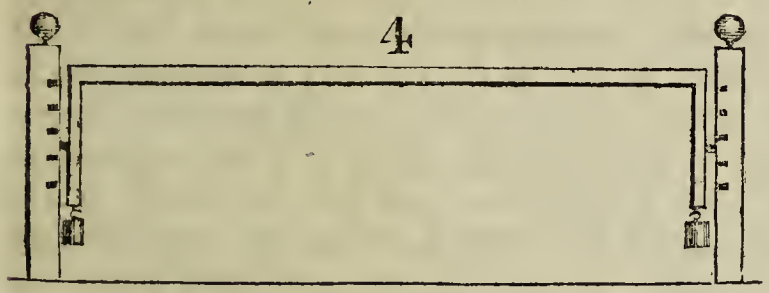
Inventions, Discoveries, & Processes.

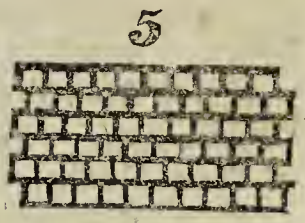
Mr. Dickenson's Improvements in Horse Shoes and the Appurtenances of the Stable 81
Water-wheel Question..... 84
Preparation of Oak Timber—Prevention of Dry-Rot..... 85
Smith's Patent Steam Engine Boiler 89
On the Extract of Mimosa Bark for Tanning 90
Vaughan's Steam Engine 91
Patent economical Substitute for Gum 91
Process of Etching on Steel Plates 92
Natural Philosophy, No. 20.—Optics—Of Burning Glasses 93
Remarkable French Patents .. 94
Coating for Specula—Steam Engines—Marquis Origo—Aurora Borealis 95
Premiums, Patents, and Correspondents..... 96











MR. DICKENSON'S* IMPROVEMENTS IN HORSE-SHOES, AND THE APPURTENANCES OF THE STABLE.

"To the Editor of the Register of the Arts and Sciences, &c.

"Sir,

"Chance having brought under my observation some valuable improvements appertaining to that noble and useful animal, the horse, it affords me much pleasure to have the power of laying them before the public through the medium of your widely-circulated journal. My knowledge of the veterinary art is, however, so ex-

* Robert Dickenson, Esq. of New Park Street, Southwark.

tremely circumscribed, that I regret a communication of this kind should not have fallen into hands better qualified for the task; and I shall for that reason confine my observations to a few leading points, leaving the prosecution of so important a subject to others of more information.

"Mr. Colman, the distinguished professor of the Veterinary College, says, that 'no animal, nor any part of an animal can be preserved in health, where the natural functions are perverted;' and he strongly urges the necessity of some great alterations being made in the practice of shoeing horses, so that a portion of the weight of the animal may be sustained by the *frog*, which from its central projection in the foot, and the tough elastic nature of its substance, was evidently designed for that purpose. In a recent paper on the same subject from the pen of Mr. Cherry, that gentleman entirely coincides with the author just quoted, and considers that not only the frog, but the sole also (which is that horny portion of the foot between the frog and the exterior wall or crust of the hoof) should be made to sustain its proportion of the superincumbent weight; and he adds, that *any treatment which deprives these parts of pressure, 'must, according to true physiological principles, induce 'disease.'*

"It is evident that a horse in a state of nature presses with the whole surface of his foot upon the ground; the rim of the hoof by its angular projection, preventing slipping; and the frog (which Mr. Dickenson has aptly compared to India-rubber) serving as a cushion to prevent any ill effects from violent concussion. By the ordinary mode of shoeing, however, the whole weight of the horse is thrown upon this angular rim, or wall of the hoof, contrary to the designs of Providence, and the plainest dictates of common sense; for being shod with a thick bar of iron on this part, the foot is thereby lifted up, forming a hollow cavity within the shoe, which (as Mr. Cherry says), 'deprives the foot of that support which it would otherwise 'receive from the earth, and *greatly deranges the mechanism of the 'whole foot.*' The same author proceeds to observe, that the feet of farm-horses, though usually in that condition termed a state of neglect, will upon examination be found generally 'moist, cool, and 'healthy; while a foot kept clean, is dry, brittle, and full of cracks,' which is evidently owing to the shoes of the former being usually clogged with earth, by which the whole surface of the foot is made to sustain the pressure, instead of the mere rim; the earth likewise contributes to the healthful condition of the feet by a supply of moisture for absorption. 'Perhaps,' Mr. Cherry continues, 'it 'may be possible to prepare some compressible and adhesive sub-'stance to fill up the cavity, after the shoe is on, which shall give '*support to the whole foot*, yet, without impeding the full action of 'its elastic properties; but as I am not acquainted with such a sub-'stance, I must confine my suggestions to Stable Treatment, content 'that horses shall continue to be shod as they now are.'

"Whether Mr. Dickenson availed himself of this hint in the invention of his Improved Shoe, or whether it originated in the sugges-

tions of his own mind, is a point upon which I am not informed; but it appears that he has completely succeeded in producing one which the enlightened writers before mentioned have considered as the important desideratum, and which, I doubt not, will be deservedly appreciated by the public.

"*Fig.* 3 exhibits a plan of the Improved Shoe as fitted on to the foot. A piece of stout leather is cut to cover the whole under surface of the hoof; and on to this is rivetted a plate of iron of a shape and magnitude to cover the frog, which it is designed to protect against injury in travelling upon hard stony roads: under the leather covering is stuffed into the hollow of the hoof a quantity of sponge, and the shoe being nailed on through the leather, the whole is thus simply and permanently secured, until the iron shoe is worn out; the leather lasting out several iron shoes owing to its compressible elastic nature. The absorbent nature of the sponge keeps the foot always moist, and the whole surface of it is brought to sustain the pressure, advantages enjoyed by the horse in a state of nature, and rendered more essentially important by the severe toils imposed upon him by the art of man. It will be observed, that the iron rim of Mr. Dickenson's Improved Shoe is curved after the French manner, as shown in the side view of *Fig.* 2, which is decidedly preferred to the flat, or common English shoe, shewn in *Fig.* 1.

"From the rapid action of a horse's feet, it is not easy to discover the precise kind of motion which he makes in stepping out, and relieving his foot from the ground for the next step, but it is ascertained to be a rolling from heel to toe; now the flat shoe evidently presents an obstruction to this particular action; frequent stumbling is the consequence of the unnatural effort to overcome the difficulty, and a straining of the muscles and tendons to which nature has assigned proper limits, is among the consequences. On the contrary, the French or curved shoe (which Mr. Dickenson judiciously adopts), conforms to the natural figure of the hoof, and, consequently, presents no impediment to the full natural action of the foot; and to this circumstance may be attributed the superior surefootedness of the French horses. The absurdity of a perfectly flat shoe is manifested by the toe part being generally worn down as thin as a sixpence, while the sides are frequently half an inch thick.

"Having already extended this letter to a greater length than I fear your limits will admit, I must hasten to the conclusion by a brief description of the other figures.

"*Fig.* 4 is a representation of Mr. Dickenson's Leaping Bar, by the use of which persons may practice leaping without the least risk or obstruction to either horse or rider, and thus qualify themselves for the sports of the field, instead of undergoing that personal risk by which the requisite skill for the chace is usually attained. Two upright posts are fixed in the ground, between which the bar is made to revolve between two axles, situated as drawn. In order to keep the bar poised in the position shewn, weights are suspended at the extreme ends; so that in leaping should a horse push or strike against the bar it bends down to the earth before him, and he infallibly clears

it, even if he were not to leap a foot high. As some horses may not be disposed to leap when they have discovered the trick of the bar, it may be loaded with more weight, and they may thus be punished into the performance; and the expert may, if they desire it, have the bar fixed by bolting it with a little bolt which is shot into the side post. The notches in the posts are of course to receive the axles of the bar, so that it may be put into any of them to raise and depress it as required. The bar should also be covered with furze, which I have omitted to draw to prevent confusion. I am informed that one of them is forthwith to be put up at the Horse Bazaar, for which that establishment will be indebted to the liberality of the ingenious inventor.

"To remedy the ill effects, and lessen the waste of corn caused by the usual manner of feeding a horse, by which he spills a great portion, and swallows a great deal unmasticated, which passes through the body unchanged; Mr. Dickenson has adopted a very simple and effectual contrivance, which he calls his *masticator*, and it is employed in the following manner. A part of the manger, about eighteen inches long, is separated from the rest by a partition, into which the feed of corn is put, and over this the masticator *Fig.* 5; which is made of a thin plate of wrought iron, about one inch less both in length and breadth than the receptacle in which it is put, uniformly cut out into square holes about 5-8ths of an inch diameter, in the manner drawn. The horse in feeding works this plate about with his mouth and tongue, and easily extracts the corn as rapidly as he can thoroughly masticate it, proceeding at length to clear away every grain, when the masticator lies flat upon the bottom of the manger. The beneficial consequences that result are an increased facility of digestion, inducing health and enjoyment to the horse, and the saving of a considerable portion of corn commonly wasted in the ordinary manner of feeding.

"Mr. Dickenson has made several other improvements in the concerns of the Stable that are worthy of attention, and being satisfied that the inventor is desirous that the public should partake in their advantages, I purpose making them the subject of a future letter, should the present be inserted.

"Your constant reader,

"*Millbank, Nov.* 1, 1824. "H. L."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Mr. Editor,

"I shall feel much obliged by your insertion of the following question in your valuable work the first convenient opportunity, and equally obliged to any of your scientific readers who will answer it, as I am very much in want of the information requested by it.

"I remain, your obedient Servant,

"JOHN WOLRAB."

If a water-wheel be ten feet in diameter and contain forty-eight buckets, *every bucket be loaded,* and each bucket equal to fifty pounds avoirdupoise, (two of the buckets, the one immediately over and the other immediately under the centre of motion or axis of the wheel, are left out in this question as they produce no mechanical effect), twenty-three of them one seventh of *the whole* diameter of the wheel nearer to the axis or centre of motion than the other twenty-three—What is the power gained in pounds avoirdupoise by the twenty-three buckets farthest from the centre of the wheel ?

ON AN ECONOMICAL MODE OF PREPARING ENGLISH OAK TIMBER, AND AT THE SAME TIME PREVENTING THE DRY ROT.

" To the Editor of the Register of the Arts and Sciences, &c.

" Sir,

" More than forty years experience in the practice of ship building induces me to hope, that the following hints relative to a new mode of preparing English oak timber, will meet with that attention which the importance of the subject deserves. From long study and observation I feel perfectly assured that the adoption of my plans would prove of incalculable benefit to ship-owners in particular, and to the nation at large.

" Instead of squaring a piece of timber, according to the usual method, by leaving the heart of the tree in the centre, my plan is to saw it right down the middle through the heart into two equal parts, immediately after the tree is felled, and my reasons for this I will now endeavour to explain to the best of my ability.

" It is, I believe, a well-known fact, that a tree does not (literally speaking) *die* on receiving the final stroke of the felling axe, but that it continues for a long period afterwards to vegetate, though less vigorously. At length, however, the sap ceases to circulate, the pores become closed, and the juices of the tree thus shut up, undergo a decomposition, and lays the foundation of dry rot. It is well known that a man who dies in good health and full habit of body soon decays ; the same effect takes place with a tree unless we adopt the same method with respect to that, as the Egyptians practised with the human body, viz. that of depriving it of all moisture,* which process would give to our timber a durability almost everlasting.

" My mind has been long impressed with this idea, but the pressure of other concerns have hitherto prevented my making the matter public. Having however recently noticed that several of the timbers in a very ancient public building which had been sawn originally in the manner I have proposed were *perfectly sound,* although they had withstood the dilapidating hand of time for seven hundred years ; while other timbers in the same building which had not been so cut, but apparently squared out with the heart in the

* Human bodies are not unfrequently found on the plains of Lybia, that have been dried by the heat of the sun, in a perfect state of preservation.—Ed.

centre were *perfectly decayed*. I have, therefore, been induced to lose no time in sending you my ideas on the subject, and I am well assured, Mr. Editor, that you will give ready insertion to them, on account of the great, I might truly say, *vital* importance of the subject.

"That the dry-rot is certainly caused by the juices being inclosed in the heart of the timber, I have had frequent opportunities of observing during my long practical experience in the repairing of ships.

"First,—In the frame of a ship (in which such large quantities of timber are employed) I have uniformly noticed that the decay commences *in the run* forward and aft*, which is owing to the timbers being fitted so close together at the heels of the timbers. The evil being thus enclosed in the heart of the timbers, and the air having no access to the exterior of them to carry off the moisture by evaporation, internal decay is the necessary consequence. I have sometimes witnessed these parts of the frame of a ship in such a rotten state, as to have been justly compared by the workmen to a heap of manure.

"Secondly,—Those timbers in the midships that have been *bored off* with the outside planks are not so affected, which I attribute to the circumstance of the holes admitting a current of air through them, the destructive juices are thereby carried off.

"Thirdly,—It frequently happens that the floor timbers of an old ship are found, on breaking up, to be nearly as sound as they were when first put in. Their preservation seems to be owing to the effect of the salt water, which, constantly laving over them, they become in a manner pickled, or, in other words, it may be that the salt entering into the composition of the wood renders nugatory the destructive effects of its natural juices.

"Fourthly,—The planks in the bottom, nearest the timbers, take the infection first; and where the tree nails are not close the disease rapidly extends endways of the grain.

"Fifthly,—Those parts of the deck planks that lie *upon the beams* are those which are first infected with the rot; the cause of which is evident, as those parts *between the beams* are generally quite sound.

"Sixthly,—In the beams of ships the decay usually commences in the internal part, which is decidedly owing, in my opinion, to the erroneous method of preparing the timber as before mentioned; but when timber so prepared is used, I would recommend as the best preventive of the rot, that a few air holes be bored through the beam fore and aft, and what would still add to the benefit, to bore another hole lengthways of the grain, to meet those which are bored crossways. But the best preventive, I am confident, would be the adoption of my mode of preparing the timber, namely, to saw it lengthways right through the heart; by which not only would much greater durability be obtained, but great economy in the consumption of the timber, as well as a great increase of strength: which I will now endeavour to shew, first, by introducing a figure, shewing an end view or section of a piece of timber.

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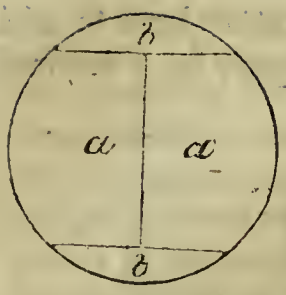
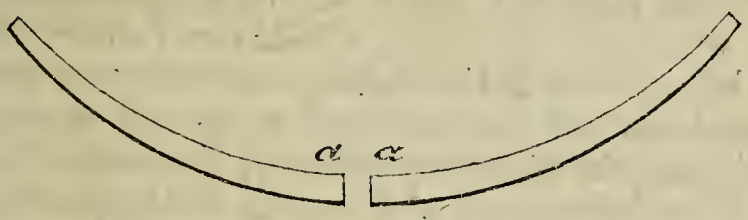
* This we understand to mean those lower parts of a ship towards the head and the stern, where the large timbers which form the ribs converge to a point, and are necessarily packed close together.—Ed.



Having procured a log of the shape required, first cut off the two slabs *b b*, and then divide the remainder *a a* into two equal parts. Being thus sawn through the heart, the air will rapidly absorb the pernicious juices, and such a seasoning may be soon effected as will, I have no doubt, effectually prevent that devastating evil, the dry rot; but my object in this place is to shew the economy of the plan in a mechanical point of view. A log thus sawn through the middle, *two* timbers are immediately provided instead of *one*, and *both of one precise mould*. Thus, when *a a* in the above figure are placed end to end, they will form two timbers exactly similar, as appears by the following figure.



"The expedition gained by this method of converting timber needs no dilating upon; every ship-builder must sensibly feel the difficulty he is often put to, and the sad waste of time and labour in preparing two such timbers to match one another. It not unfrequently happens that the framing of a ship stands still for several days owing to this circumstance. This saving of time and labour is by consequence a proportional saving of expense in the building.

"I have also proved by actual experiment that this mode of sawing the timber down the middle confers great additional strength. From the same bough of a tree, I cut two pieces of the same length and thickness; one of them I squared according to the usual plan, which I condemn; the other, according to my proposed method, leaving the circular sides as shewn at *a a* in the foregoing figures. The proportional strength of one of the circular sided pieces was as 25 compared to 27, the strength of the square timber.* It is, therefore, quite clear to my mind that nearly double the strength is gained by the same quantity of timber. That greater durability may thereby be obtained by the prevention of the dry rot, I have reason to hope that the public will ere long be convinced.

"For the timbers of a seventy-four gun ship logs of 22 inches diameter are usually employed; if these are divided according to my method, instead of being squared, their strength and width of bearings for the planks will be fully adequate, and the little difference of strength may be easily compensated by two or three more timbers, for which there will be plenty of room, and the saving of expense will thereby be immense. By the most accurate calculations that I have been able to make, I find the saving in timber only to be full one third.

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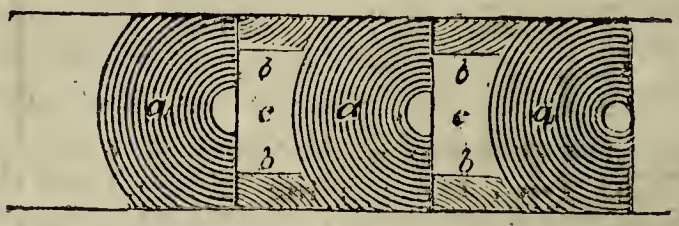
* Our ingenious correspondent might have added, that as each piece sustained 25, the proportions were as 50 to 27, which is an increase of strength equal to 23 in 50.—Ed.

"To prevent any mistaken notions, I think it better here to add a sketch of three of my timbers as they would appear in a vertical plan of a portion of a ship's side:



"*a a a*, three of the ship's timbers, shewing their relative position in the ship's side; *b b b b* are the fillings made from the slabs, as shewn in former sectional figure, which are uniformly of the right shape. *c c* are the air passages, which serve effectually to carry off all the remaining juices in the timber, and it will be noticed that the hearts of the trees are thus exposed to its full effect. It will also be perceived that the circular position of the grain forms a band of strength to the interior part, and enables the timber to bear a much greater strain than if it was sawn square; as I have proved by the experiment before mentioned. From long observation and repeated experiment, I am indeed convinced, that the *outside* or younger part of a tree *is stronger, more durable,* and *more sea-worthy than the heart.* Notwithstanding I have daily witnessed the preference given to the latter, while the former has been employed merely for fuel.

"In the repairing and breaking up of ships it happens generally that some of the planks are decayed and others not, but upon a close examination of them it will be almost invariably found, that the affected planks have the heart of the tree and the others not; it therefore follows that the present system of lining is very defective.

"To lessen the charge of carriage, it is not unusual to side the logs in the forest where the trees are felled. Now if the tree was also sawn down the middle, in the forest, an increased facility of removal would be acquired, and the timber would be seasoning, and probably be fit for use ere it came into the dock yard.

"The longer a tree remains whole after it is felled, the more sap it will contain, and the more rapid will be its decay. I have seen trees that were sound when felled, but having lain a long time on the ground with their juices shut up in them, rapidly decay from the heart outwards. The dividing of the trees would have preserved them.

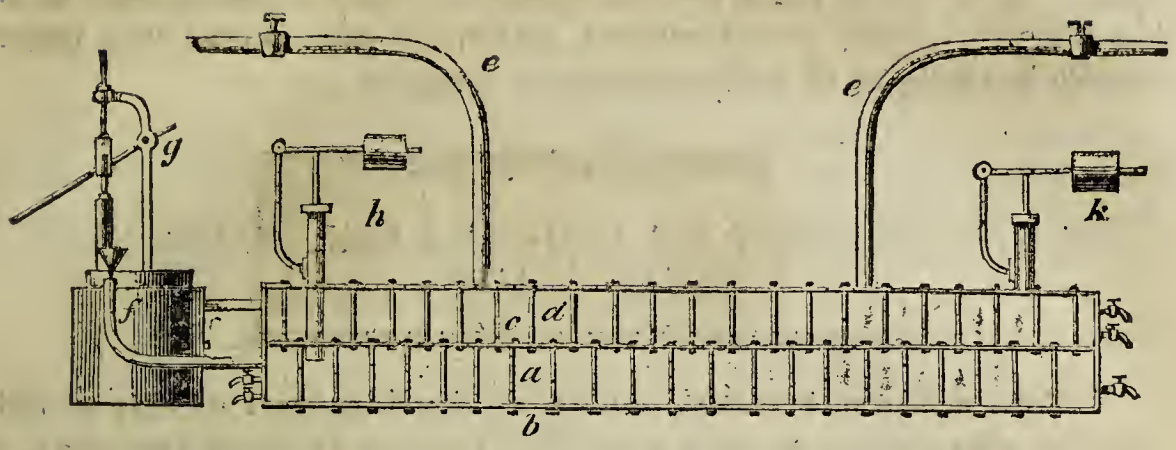
"Having now concluded my observations, and given an outline of my plan for converting English Oak-Timber, I beg leave to conclude with expressing my firm belief, that had my improved mode been adopted in the building of those grand and beautiful machines which form the present British Navy, not a rotten member in their frames would be found amongst them, instead of the lamentable rotten condition in which the greater part of them are, according to public report, wholly or partially reduced.

"I remain, Sir,

"Your constant Reader and humble Servant,

"*Judd Place, Pancras,* "JOHN GREGORY."

"*2nd Nov.* 1824.



MR. SMITH'S PATENT STEAM ENGINE BOILER.

In the 26th number of this Work we gave an account of a new patent apparatus for the boiling and concentration of solutions of sugar, &c.; the present invention is a modification of, or rather an addition to that apparatus, by which it is made peculiarly applicable to the generating of vapour for steam engines.

The former invention consisted in the application of the lower vessel (*a*) alone; (the engraving represents it in section, and the figure of it is supposed to be an oblong square.) The top and bottom of the vessel (*a*) are strongly tied together by means of screw bolts, which are placed at about nine inches apart over its whole space, and thus is obtained great strength in a boiler with the advantages of very thin metal, by which the heat is transmitted more readily, and at a less expence of fuel. The water is supplied to this vessel by means of the pipe and funnel *f;* it has a guage cock for ascertaining the depth of water it may contain, and two drawing-off cocks; a safety valve *h* is likewise attached, with a variable weight.

The present invention consists in adding to the part already described the upper vessel *d,* which is constructed in the same manner as the lower one; but so that the upper part of the lower one forms the bottom of the upper one, or, as it were, a partition between them, (*see c.*) A pump *f* supplies the vessel *d* with water; at the other end are placed two guage cocks; also a safety valve *k,* loaded with a variable weight to regulate the pressure.

About two inches deep of water is put into the lower vessel, and the other being half filled, the fire is lighted; which quickly raises the water in the lower vessel to ebullition, the steam of which acts upon the surface of the upper boiler, giving out its heat to the water contained therein; but becoming itself thereby condensed, it falls back in a shower into the boiling water below, and being thus alternately raised and condensed, sufficient heat is given off to the contents of the upper vessel, to convert that into a steam chamber of an uniform temperature; to which any required degree of pressure may be given. The steam is conveyed from the upper vessel along the pipes *e e,* to actuate the engine.

The patentee does not confine himself to the precise construction of boiler herein described, but claims the several modifications of the

apparatus to which the principle extends. Some improvements have been already made, we understand, which we hope to have the pleasure of noticing in an early subsequent number.

ON THE EXTRACT OF MIMOSA-BARK, FROM NEW SOUTH WALES,

FOR THE PURPOSE OF TANNING LEATHER.

It appears from evidence laid before the Society of Arts, that not only all the oak-bark grown in this country is purchased by the tanners, but that considerable importations of foreign oak-bark take place to the amount of about 10,000 tons per annum. Of this nearly the whole is used by the tanners who live in London, and other places on the coast; and of the whole quantity used in London and its immediate vicinity, near four-fifths are foreign bark, exported from the opposite coast of France and Flanders, and selling at the rate of about £14. per ton.

The quality of leather is estimated in a considerable degree from its colour; the paler it is the better price it bears in the market. The importance, however, of this character has been greatly overrated; for although it be true that bark which is old, and has been injured by fermentation, will produce a brown leather, brittle, and of bad quality, yet it by no means necessarily follows that dark-coloured leather is therefore inferior in any of those properties in which the real value of this substance consists.

The bark of the elder and of the larch are each of them capable of converting skin into excellent leather; but on account of the reddish brown colour of such leather, it is very difficult of sale. A similar objection applies in a greater or less degree to leather prepared by the extract, either of oak-bark or of mimosa-bark; but as from the testimony of professional persons, and from an examination of the specimens produced before the committee, the colour appears, in these cases, to be no indication whatever of inferiority, there is good reason to expect that this prejudice, as far at least as it is prejudice, may in time be overcome.

From experiments made by Mr. Brewin, of Bermondsey, and by other tanners, it appears that a given weight of the extract of mimosa will produce as much leather as from four or five times its weight in oak-bark of fair average quality. It is therefore not quite equal in strength to the extract of oak-bark. The comparative price, however of the two more than counterbalances this inferiority, for, notwithstanding the cost of freight from so distant a country as New South Wales, the expense of bringing it to market must, upon the whole, continue to be very moderate as long as the mimosa trees shall be cut down for the purpose of clearing for cultivation the land on which they spontaneously grow.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"ON perusing the account given in your last number of Mr. Vaughan's Steam and Air Engine, I am unable to perceive a difference between it and the atmospheric engines in use before the improvements of the immortal Watt; for suppose the two cylinders to be connected by a lever beam instead of two rods, and it will then be an atmospheric engine with two cylinders.

"Neither do I perceive that there can be any gain by acting with the atmosphere, for its pressure being equal all ways can afford no benefit but by a corresponding loss.

"To make all this clearer, suppose the atmospheric pressure = a = 14lbs. per inch square steam used at 4lbs. + a vacuum a − 12.

"Then one cylinder will have on its piston a pressure on one side of a+4 acting against a on the other side, leaving an effective pressure of 4lbs. and the other *a* acting against a − 12 leaving a power of 12lbs.

"12+4 = 16lbs. effective power per square inch of piston, and a common engine working by steam against a vacuum will equal 12+4 = 16 lbs.

"So after considering the inconvenient form, extra cost, and loss of steam by condensation, which will be great from the casing exposing a large surface to the air, and the air following the piston, how can this engine be considered an improvement?

"Should I have mistaken the intentions of the engine I am ready to confess myself in error when explained to me.

"Sir, your's, respectfully,

"A SHIPWRIGHT."

NEW PATENT ECONOMICAL SUBSTITUTE FOR GUM.

THIS Patent has been taken out by Mr. J. Bordieu, of Lime Street, in consequence of a communication from a foreigner residing abroad. The mucilage is extracted from the seed of the Carob-tree, commonly called St John's Bread, and is of such a strong gummy consistency, that it is said one pound of the flour will go as far as eight pounds of gum-Senegal, or nine or ten pounds of gum-Arabic.

The seeds, after being extracted from the pods by drying, and beating, are to have their skins taken off by immersion for six hours in sulphuric acid, when they may be peeled by rubbing. The seeds are then to be dried and ground by a mill, or pulverized by pestle and mortar, and the powder which results is to be made use of in the same manner as starch, gum, and other adhesive mucilaginous matters, employed in mixing with the colours for printing on linen, woollen, cotton, or silk. The mordants usually employed in dyeing or printing stuffs act on the carob-seed powder in the same manner as the mucilages heretofore employed.

ETCHING ON STEEL PLATES.

This valuable improvement in the art of engraving, for which we are much indebted to the ingenuity and perseverance of the late Mr. Warren, is now brought very extensively into use, on account of the vast number of impressions that may be taken without the least sensible defect. In one of Mr. Warren's plates, Mr. Hie, the printer, certified that the artist's own proofs were not taken off till after the twenty-thousandth impression.

The plate being decarbonized and softened by the usual process of cementation, is afterwards made ready for the engraver by cleaning and polishing. The artist commences his operation by first laying the etching ground, which should be rather thicker than on copper, in doing which the plate should not be heated quite so much as copper, which would cause the ground to crack as it cools, and present a honey-comb surface. The menstruum recommended for biting in, is made with half an ounce of crystallized nitrate of copper, dissolved in a pint and a half of distilled water, and a few drops of nitric acid added to the solution. Mr. Warren generally found about two minutes sufficient for an outline, unless required very strong; the middle tint was produced in about ten minutes, and the darkest shadows in forty minutes.

The menstruum should not be more than one-sixth of an inch deep on the plate, otherwise it will be difficult to see the work, and it becomes exhausted in about ten minutes, and then requires to be replaced. While the menstruum is acting, the work must constantly be swept with a camel-hair brush, in order to remove the precipitated copper, which if allowed to remain in the lines, renders their edges rugged, and destroys their beauty; especial care must be taken to clear the ends of the lines, as these are most liable to bite foul. In stopping out, the ground (Brunswick black) must be laid on very thin and even, and instead of terminating abruptly must be smoothed off very gradually; for the smallest ridge or prominence will retain the precipitated copper, and then the ground will infallibly be penetrated, and the biting will become foul. By attending to these directions, an etching may be obtained on decarbonized steel, as deep and quite as sharp as it can be on copper.

Mr. Turrell's menstruum for etching on steel, is composed of four parts of the strongest pyroligneous, or acetic acid, and one part of highly rectified spirits of wine, which are mixed together by gentle agitation for half a minute: one part of pure nitric acid is then to be added, and when thoroughly mixed, it is ready to be poured on the plate. With these proportions very light tints are obtained in a minute, deep tints in a quarter of an hour, the darkest in half an hour. If more expedition is required in the deep tints, it is obtained by the addition of a little more of the nitric acid, or on the contrary, slower, by the omission of any proportion. It is recommended that the plate be well washed after the biting is effected; and that no more of the mixture be made at a time than is required, on account of the volatile nature of the spirit of wine.

Both the public and the artist are eminently benefitted by this discovery; the public by having a multitude of impressions as good as copper-plate proofs, and the artist in greatly extending the range of his reputation by the permanence thus given to the finest and most characteristic touches of his hand.—*Abri. Trans. Soc. of Arts.*

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 20.—Optics.

(Continued from page 76, Vol. 2.)

Of Burning Glasses.

Every lens, whether convex or plano-convex, will collect, by refraction, the rays of the sun dispersed over its surface into a point, and thus become a burning lens. As all the rays which fall upon the lens are united in its focus, their effect ought to be so much the more, as the surface of the lens exceeds that of the focus. Thus, if a lens four inches broad collects the sun's rays into a focus at the distance of one foot, the image will not be more than one tenth of an inch broad. The surface of this little circle is 1600 times less than the surface of the lens, and consequently, the sun's rays must be ten times denser within that circle; it is not therefore surprising that it burns with a degree of ardour and violence exceeding any culinary fire.

The most considerable of these glasses are those which were made by M. Ischirnhausen and Mr. Parker. The diameter of that of Ischirnhausen was three feet; the focus was formed at twelve feet, and its diameter one inch and an half, and weighed 160 pounds. To render the focus more vivid, it was collected a second time by a lens placed parallel to the first, and so situated, that the diameter of the cone of rays formed by the first lens was exactly equal to the diameter of the second lens, so that it received all the rays; the focus was contracted to eight lines, and its force was encreased proportionally.

The lens made by Mr. Parker, of Fleet-Street, is formed of flint-glass three feet in diameter, and when fixed in its frame, exposes a clear surface of two feet eight inches and a half in diameter; weight 212 pounds, focal length, six feet eight inches; diameter of the focus, one inch. A second lens was used, which reduced the focus to half an inch.

Some of the principal effects produced by these glasses were as follows:

1. Every kind of wood took fire in an instant, whether hard or green, or soaked in water.
2. Iron plates became hot in a moment, and then melted.
3. Tiles, slates, and all manner of earth became red in a moment, and vitrified.
4. Sulphur, pitch, and all resinous bodies melted under water.
5. Fir-wood exposed to the focus under water, did not seem changed, but when broken, the inside was burnt to coal.

6. If a cavity were made in a piece of charcoal, and the substances to be acted on were put in it, the effect of the lens was much increased.

7. Any metal whatsoever, thus enclosed in the cavity of a piece of charcoal, melted in a moment the fire sparkling like that of a forge.

8. The ashes of wood, paper, linen, and all vegetable substances were turned in a moment into a transparent glass.

9. The substances most difficult to be wrought were those of a white colour.

10. All metals vitrified on a China plate, when it was so thick as not to melt, and the heat was gradually communicated.

11. When copper was thus melted, and thrown quickly in cold water, it produced so violent a shock, as broke the strongest earthen vessels, and the copper was entirely dissipated.

Though the heat of the focus was so intense as to melt gold in a few seconds, yet there was no heat at a small distance therefrom; and the finger might be placed in the cone of rays within an inch of the focus, without receiving any hurt.

Mr. Parker had the curiosity to try what the sensation of burning at the focus was, and having put his finger there for that purpose, he says it neither seemed like the burning of a fire, nor a candle, but the sensation was that of a sharp cut with a lancet. By means of a burning glass, a piece of wood may be charred or burned to a coal in a decanter of water, and yet the sides of the decanter through which the rays pass so very near the focus, will not be cracked nor any ways affected; nor will the water be in the least degree warmed. If the wood be taken out, and the rays thrown on the water, no continuance of collected rays, in this way, will either heat the water or crack the glass: but if a piece of metal be put into the water, it soon becomes too hot to be touched, and communicating its heat to the water, makes it not only warm, but sometimes causes it to boil.

Though water alone be not affected, yet, if a little ink is thrown into it, the water will soon be heated.

(To be continued.)

REMARKABLE FRENCH PATENTS IN 1823.

Atmospherical Clock.—To B. C. Leroy, of the Palais Royal, for five years, for a clock or time piece, which winds itself up by the effect of the wind.

Silk Bonnets and Hats.—To Madamoiselle Manceau, Rue Sainte Avoie, Paris, for fifteen years, for a woven fabric of silk, imitating the Leghorn straw, for making men and women's hats, &c.

Paving Rammer.—To T. Piquant, of Prémieres, Côte d'Or, for five years, for a new machine for stamping and ramming squares of pavement, which he denominates *Rebattairs Mécanique.*

The French Mover.—To P. Pillard, sen. of St. Pierre-les-Tertres, Aube; for five years, for a new mover which may be adapted to all kinds of machines, which he calls *Moteur Français.*

Sawing Marble.—To F. Sauvage, of Boulogne, Pas de Calais, for five years, for a machine to saw marble by means of the wind.

Hydraulic Machine.—To J. H. Testier, and J. H. Dalavigne, of

Nantes, for five years, for a machine combining a sucking and a forcing pump, which are wrought by continual rotation.

Crystallized Paste.—To J. F. Vernet, and J. C. Gotten, of Paris, for five years, for a crystallized paste, for the purpose of making reflectors, lanterns, and other things that require transparent envelopes for light.

Tower of Hair!—To L. Wolf, of Strasburg, for five years, for *a cylindrical tower of false hair with perpetual curls.*

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Coating for Specula.—An amalgam of two parts of mercury, one of bismuth, one of lead, and one of tin, is sometimes used to cover the surface of glass so as to produce a mirror. This coating, from its great fluidity, is subject to the inconvenience of being easily displaced in the course of experiments. To procure some other alloy of a more fixed nature, suited to reflecting surfaces, M. F. Lancelotti has successfully laboured to discover. He found that a compound of three parts of lead and two of mercury, fused together, and thrown with a quick and dextrous motion over the heated and clean dry surface of the glass, formed a coating which adhered firmly to the glass. It is essential that the glass should be uniformly heated and cooled; and that after the amalgam is fused, its surface should be perfectly cleared from any powder or oxide.

Steam Engines.—The value of the steam engine to this country may be estimated from calculations which show that the number of steam engines in England represent the power of 320,000 horses, which is equal to that of 1,920,000 men; which being, in fact, managed by 36,000 men only, add actually to the power of our population 1,834,000 men.

Marquess Origo has just made at Rome a successful trial of a new fire engine. By his method, the water propelled in mass, and falling in torrents on all the parts on fire, covers them instantly with so great a volume of water that the most impetuous flames are compelled to yield to this species of universal inundation. The experiment was made with great success by the Inventor, in the presence of a number of savans. It perfectly succeeded, both with reference to the handiness of the manœuvre and the rapidity of the result, which did not require more than a few minutes.

Aurora Borealis in Iceland.—Dr. Thienemann, who passed the winter of 1820-21 in Iceland, made numerous observations on the Aurora Borealis, of which the following are the general results:—1st. the Aurora Borealis has its place in the lightest and highest clouds of our atmosphere. 2. It does not occur in the winter, and at night only, but at all times being visible, however, only in the absence of the sun's rays. 3. It has no determinate relation with the earth. 4. No sound occasioned by it has ever been heard. 5. The form in Iceland is generally that of an arc, extending from N. E. to W. S. W. 6. The motions are variable, but always occurring within the limits of the clouds containing the meteor.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

WHEAT.—For the best set of experiments made on not less than twelve acres, four of which are to be sown broadcast, four drilled, and four dibbled; the two latter in equidistant rows, in order fully to ascertain which is the most advantageous mode of cultivating wheat.—The Gold Medal.

Certificates required giving every particular, and the expences attending the culture.

BEANS.—To the person who shall discover and cultivate, either by the drill or dibbling method, on not less than five acres, a species of horse beans, or tick beans, that will ripen their seeds before the 25th of August.—The Silver Medal.

It is apprehended that if a bean should be brought into cultivation with the habits of hotspur, or other early peas, it would in a great measure escape the danger arising from the collier insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat.

Certificates required, giving every particular and expense of culture.

PARSNIPS.—To the person who shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the particular purpose of feeding cattle or sheep.—The Gold Medal.

Certificates required, giving every particular and expense of culture.

RECENT PATENTS.

METAL CASKS.—To Robert Dickenson, Esq. of Park Street, Southwark, for improvements in the construction of metal casks for the conveyance of goods and products by sea, or otherwise.—Dated October 7, 1824.

VINEGAR.—To Mr. John Ham, of West Coker, Somersetshire, for an improved process in manufacturing vinegar.—Dated October 7, 1824.

ZINC OR SPELTER.—To Mr. F. Benecke, of Deptford, and Messrs. D. and J. Shears, of Fleet Market, London, for an improved method of preparing zinc.—Dated October 7th, 1824.

STEAM ENGINES.—To W. Foreman, Esq. of Bath, for certain improvements in the construction of steam engines.—Dated October 7th, 1824.

STEEL.—To F. H. W. Needham, Esq. of David Street, Middlesex, for an improved method of casting steel.—Dated October 7th, 1824.

TO OUR READERS AND CORRESPONDENTS.

Our friend from College House may rest assured that our pages shall ever be open to the freest discussion. We conceive that by the collision of differing opinions alone new conceptions are elicited, and we hope that we are not such poor philosophers as to be bigotted to our own opinions.

With reference to the letter of A SHIPWRIGHT, in a former page, we find that by a simple omission we are involved in a predicament which three words would have averted. The article on Mr. Vaughan's Engine was furnished by a gentleman whose opinion we fancied would not have committed us. Had we ourselves seen the engine, or the article at an early hour, the terms which were used might have been more qualified.

J. L. E. will appear in our next.

H. S. W. shall have early attention.

We cannot enter into controversy so foreign to a matter of science as that to which A. J. alludes.

H. N. must be under some mistake; we never received the packet he mentions.

We hope our friend from Canterbury has not forgotten his promise.

A Pedestrian will find an account of the Roman roads in Gibbon. Why should he be so angry with Mr. Mc. Adam?

By the plan proposed by C. E.** of making the bottoms of saucepans and tea kettles hemispherical, he will gain nothing but the *loss* of space!

Distich should use better language before he can be attended to. Abuse is a sorry weapon.

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REGISTER

OF

THE ARTS AND SCIENCES.

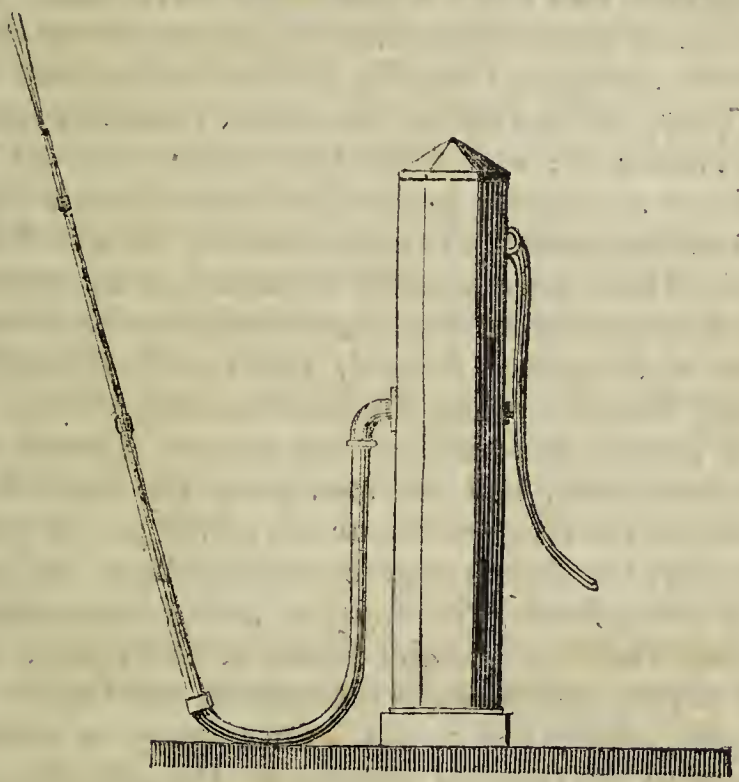
No. 31.] SATURDAY, NOVEMBER 27, 1824. [Price 3*d.*

CONTENTS:

Inventions, Discoveries, & Processes.

New Fire Pump at Aldgate.... 97
Patent Alloyed Copper for Sheathing Ships 99
Hancock's Patent Composition for Ropes, Canvas, Wood, &c. 100
London Chemical Society..... *ib.*
Natural Philosophy, No. 21.—Optics—Of Microscopes 102
Browne's Filtering Stone..... 103
Smoke Preventive 104
Perkins's Steam Gun 105
Brown's Steam Carriage 107
Encyclopædia of the Useful Arts, No. IV. 108

Miscellaneous.—The Mexican Mines—-Plate—-Combustion of Iron by Sulphur—Rio Vinagro —Red Snow 110,111
Premiums, Patents, and Correspondents..... 112



THE NEW FIRE PUMP AT ALDGATE.

That well-known citizen's land-mark, Aldgate Pump, was the last week rendered more remarkable by the introduction along side of it of "A FORCE PUMP IN CASE OF FIRE," as inscribed on the iron casing which encloses it; of which the above engraving is a correct representation.

We had hoped to have been enabled to have given a mechanical description of the peculiar construction of this pump, which we are informed possesses some novel and important improvements, by which so considerable an increase of force is obtained, that it may

be said to embrace all the properties of a fire-extinguishing engine, excepting as to its being stationary. Our informant's description was not however sufficiently intelligible to us, to enable us to lay it before our readers in the present number of the Register, but we hope to be in possession of the plan against our next impression.

The fire-pump in being stationary, has, however, some important advantages, which more than counterbalance that inconvenience; it is placed over or near to a large and deep well, from which may be drawn at all times an almost inexhaustible supply of water, thus securing all the houses in the neighbourhood from the effects of any serious conflagration; the power of the pump being sufficient to throw the water over the houses: and, when a fire happens at a distance from the spot, beyond the range of the pump, or the length of the hose belonging to it, it furnishes from its abundant source an *immediate* supply of water to the common engines, by connecting the hose to their cisterns; and thus may its usefulness be extended to very great distances. The screw of the pump nozzle is adapted to the screws attached to the hose of the fire engines, so that it may be at any time brought into action in the manner required.

It often happens that a fire which might have been extinguished by a few pails full of water when first discovered (were the means at hand) extends its ravages so rapidly ere the engines can arrive, and be brought to play, as to require the united force of several of them afterwards to reduce it; and when the engines are on the spot a considerable delay sometimes takes place from there being no water in the mains, and the turncock is not in the way to turn it on. These are serious evils which were sensibly experienced in some of the late fires, but which cannot occur in those situations where there is a fire-pump like that at Aldgate. Indeed, this excellent security against fire was scarcely erected, when the late fire broke out in Leadenhall Street, and its powers were called into action, though not so fully as they might have been, had the men gone the right way to work. The fire was within the range of the action of the pump, and no engine was necessary, but the Parish engine being brought out, and the men who worked it being fearful *(perhaps)* of losing their reward, if they did not, attached their hose to the nozzle of the pump, by which an uninterrupted supply was given to the engine, and the fire was quickly reduced. So far, *well*; but it will be necessary to make some new arrangements as to the rewards, otherwise, the loss of much property may be the consequence of not employing the readiest means of extinction.

It appears that the common street pumps cannot raise water higher than their spouts, having been constructed merely for the filling of buckets, &c. Now when it is considered that under each of these pumps, which are very numerous, there is a capacious well, what excellent means are here supplied for the saving of property to an incalculable amount, as well as lives. The expense is not deserving of notice, as no one will dispute its being the truest economy. It would not come to a *tithe* of the insurance money paid annually upon the property in the vicinity. If the inhabitants within the sphere of

action of such a Pump were to reduce their insurances to half their amount, they might save money, and at the same time acquire an increased security. The fire-office folks will not thank us for this hint, but we have no desire to see houses burning, with all the calamitous and distressing results, for their sakes.

From the inscription on the pump, as well as from private information, it appears that this excellent example set by Aldgate has originated in the well-directed zeal of that public-spirited magistrate, Alderman Thorpe.

PATENT ALLOYED COPPER FOR SHEATHING SHIPS.

Mr. Robert Mushet, of the Royal Mint, has lately taken out a patent for certain means or processes, for improving the quality of copper and alloyed copper, so as to render it more durable when employed as sheathing to ship's bottoms, " and for other purposes "

It is a well known fact that, owing to some defect in the manufacture of copper, the sheathing upon a ship is sometimes worn away by oxidation in a much shorter period than usual, lasting only one, two, or three voyages, instead of five, six, seven, or more (according to the time and distance, and the thickness of the copper). The cause of this, Mr. Mushet considers to arise not simply from the impurity of the metal, but from the particular character, or undue proportion of the alloy, with which it may be mixed.

Nevertheless, the patentee has found that the purest copper exposed to the action of sea-water is not so tenacious as when alloyed in the manner he proposes in his specification, and on which he founds his patent.

The alloys employed, are block or grain tin, the regulus of zinc, of antimony, and of arsenic, in the following proportions :

To 100lbs. of copper add 2 ounces of the zinc, or
To 100lbs. ditto 4 ounces of the antimony, or
To 100lbs. ditto 8 ounces of the arsenic, or
To 100lbs. ditto 2 ounces of the grain tin.

Or, the above mentioned alloys may be employed in conjunction instead of separately, in the following manner :—To 100lbs. of the copper add half an ounce each of the zinc and tin, one ounce of the antimony, and two ounces of the arsenic. By these admixtures, the patentee states that the copper is rendered much more cohesive than when it is in its pure state ; besides causing it to assume a more fibrous texture.

As these alloys are very apt to evaporate during the process, the patentee directs that an assay be always made after the mixing, to ascertain the proportions of the constituents.

The patentee claims as his invention, the adding to or taking from copper such quantities of other metals as will bring the alloy to the proportions before-mentioned, or nearly, which, it is stated, will prevent the corrosive effects of the sea-water upon it.

HANCOCK'S PATENT COMPOSITION FOR ROPES, CANVAS, WOOD, &c.

The object of the Patentee is the making of an elastic Composition to cover those substances for which pitch and tar are usually employed to protect, from the effect of the weather; such as ropes, canvas, wood, &c. It is well known that pitch and tar afford a very inefficient preservation to such matters, owing to their cracking, peeling, melting, or washing off; the patentee therefore proposes to combine with them a certain proportion of the elastic gum caoutchouc (or Indian rubber), previously dissolved in the usual manner, in concentrated spirits of turpentine, which is then to be mixed with the pitch and tar in a warm state, producing thereby an elastic fluid impervious to water, notwithstanding the expansion or contraction of the substances upon which it may be laid. In the making of ropes, the compound may be worked up in the usual way during the manufacture; on wood, canvas, and other materials, it may be laid on with a brush; in the paying of ships, boats, or other vessels, it may be laid on with a trowel or other suitable means, &c. The patentee rests his claim to the combination of the abovementioned materials, in every proportion in which they may be employed, which will vary according to circumstances, the flexible nature, or expansibility of the substances upon which they are to be laid.

LONDON CHEMICAL SOCIETY.

The inauguration of the officers of this Society was performed last night at the City of London Tavern, in the presence of a very numerous assemblage of ladies and gentlemen, the greater part of whom had become members of this Institution for the promotion of one of the most useful and important branches of scientific knowledge.

At half-past seven o'clock, the President, Dr. Birkbeck, entered the room, accompanied by the Vice-Presidents and Committee.

Mr. Mareco, the Chairman of the Committee, took the Chair, for the purpose of opening the business of the Society. He announced that the labours of the Committee for the formation of the Institution had terminated; and the Secretary then read their report, which detailed the origin and preliminary progress of the business of the Society.

Dr. Birkbeck then took the chair, and delivered an eloquent introductory lecture, explanatory of the objects of the Society, and of the general principles of chemistry, illustrating as he went on by practical experiments the elementary parts of his discourse. There was a perspicuity in this lecture which was very creditable to the President.

He described the universe as being pregnant with unceasing variety, and explained the progressive decomposition of matter, which is in constant action. He then explained the two distinct series of the phenomena belonging to the planetary system, and to

the animal world—the one fixed and immutable, the other actuated by motion, perceptible and imperceptible. The learned Doctor took a rapid view of the operations of chemistry in the middle ages.

The first book of real practical information which he quoted, was that published in the year 1650, entitled *Physica Subterranea*; and from that he passed to the enumeration of the labours of the illustrious Lavoisier, and from thence to the experimental labours and discoveries of Sheele, Black, Bergman, Cavendish, and Priestley, concluding the list of scientific benefactors of our times with the name of Sir H. Davy, upon whose important discoveries he pronounced a warm panegyric. He then briefly considered and explained the laws of attraction and repulsion, and illustrated the former by exhibiting two pieces of lead, the smooth surfaces of which were brought in contact by the adhesion of what is called cohesive force, and he demonstrated the latter by showing the repulsion evinced by the bursting of the particles of a glass drop, when broken in a particular manner. It was this principle of repulsion which he explained kept gaseous matter in a state of elastic fluidity. The learned Doctor then explained the principles of the two kinds of attraction—of electricity and magnetism, and their opposite polarities, and opposite forces; and proceeded to illustrate what is termed the attraction of composition, by exhibiting the combination of two drops of mercury, and the mode of combining powder of magnesia with water by a solution of nitric acid. He next pointed out the connexion between mechanical force and chemistry, by experiments made in the receiver of an air-pump, by combining the pressure of air with fluids, such as porter, water, &c.

His experiments explanatory of the principle of Manton's percussion-gun were extremely curious, by showing the effect of a particular combination of sulphur with a preparation of copper, which produces detonation. The principle of what is called instantaneous light he also explained, by showing the result of the application of a drop of sulphuric acid upon two parts of sugar and one of chlorate of potash. He praised the principle of Browne's* newly invented Pneumatic Engine, which was a striking instance of the effect of a primary expansion of a burning elastic gas, capable of leading to important consequences. The learned President next described the various qualities of alkali and acids, and illustrated his description by a number of very curious, and for the most part successfully conducted experiments. He concluded by exhibiting specimens of the great modern discoveries of portable gas, the safety lamp, and the protection of copper bottoms from the decomposing power of salt water: he bestowed the warmest praise on Sir Humphrey for these two last most beneficial discoveries.

The lecture did not terminate until ten o'clock, and was loudly and deservedly applauded.

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* A full account of this grand and interesting invention is inserted in the 22nd number of the REGISTER. Also an account of the Portable Gas, in No. 1.

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 21.—Optics.

(Continued from page 94, Vol. 2.)

Of Microscopes.

The word Microscope imports an instrument for viewing small objects. It was before observed, that nature has so formed the human eye, that we cannot distinctly view an object at a nearer distance than six inches: and since there is an infinity of objects, which at that distance appear either as points, or are wholly imperceptible, whatsoever instrument or contrivance will render such minute objects visible and distinct, we properly call a microscope.

It is usual to say, that the microscope magnifies the objects which are seen through it; but this is true only with regard to the *apparent*, not the *real* magnitude of objects; they indeed appear to be larger with, than without a microscope; but in truth they are not; and the reason why they appear to be magnified, will be easy to apprehend, by any person who understands the nature of the optic angle.

The apparent magnitude of objects is measured by the angle which they are seen under by the eye; and those angles are reciprocally as the distances from the eye. If, therefore, at the distance of six inches, we can but just discern an object, and then by interposing a lens, or other body, we can view that very object at a lesser distance, the object will appear to be as much larger through the lens than before to the naked eye, as its distance from the lens is less than its distance from the eye.

Since the nearer the eye can approach to an object the larger it appears, it is plain, a double and equally convex lens is far preferable to a *plano-convex* lens; because, if the sphere, or convexity, be the same, the focal length of the former is but half as long as that of the latter; and since the double convex consists of two segments of a sphere, the more an object is to be magnified, the greater must the convexity be, and therefore the smaller the sphere, till at last the utmost degree of magnifying will require that these segments become hemispheres, and consequently the lens will be reduced to a perfect spherule, or a very small sphere.

If the radius of the spherule be one tenth of an inch the eye will have a distinct vision of an object by means thereof at the distance of $1\frac{1}{2}$ radius, that is to say, three twentieths of an inch, as it is but the fortieth part of six inches it shews that the length of an object will be magnified forty times the surface of 1600 times, and the solidity 64,000 times, by such a small sphere.

If the radius of a spherule be but one-twentieth of an inch, then will the eye have a distinct vision of an object at the distance of three fortieths of an inch, which, as it is but the eightieth part of six inches, shews that the length of objects will appear 80 times greater, the surface 6400 times, and the bulk 512,000 times greater to the naked eye at six inches distance.

Again, if the diameter of a spherule be one twentieth of an inch or the radius one fortieth, then will the eye approach the object so near as the three eightieth part of an inch, which is but the 160th part of six inches; and therefore the length of objects will be magnified 160 times, the surface 25,600 times, and the solidity 4,096,000 times of this spherule; which is so great a power of magnifying as surpasses all human imagination and comprehension.

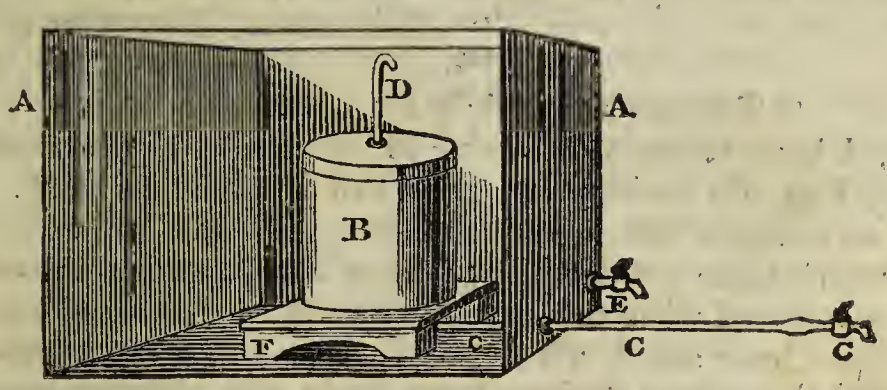
In using these spherule microscopes the objects are to be placed in one focus and the eye in the other, and since the focus is so exceedingly near the glass, it is impossible to view any but pellucid bodies; for if any opaque object were to be applied, the eye being as it were just on the spherule, it would entirely prevent any light falling upon it, and would be too obscure to be viewed.

It was with such a description of microscopes, that the famous Dutch philosopher, LEUWHENHOCK, (whose observations and calculations upon animalcule appeared in the beginning of our first volume,) made such wonderful discoveries; and it must be with these, if with any, that the copuscles, or atoms, of which bodies consist, are to be discovered; which NEWTON thought was possible. But the great difficulty of making very small and at the same time very good ones, their prejudice to the eye in poring over near objects intensely—the trouble of placing objects at a due distance—and the very small part which can be seen of any—make this sort of microscopes very little known and very little used.

(To be continued.)

BROWNE'S FILTERING STONE.

IN our 27th number, page 40, we inserted an account of this invention received from a correspondent, but as an essential part of the apparatus was therein omitted, we have thought it proper to reintroduce the subject, with a brief and corrected description of its construction:—



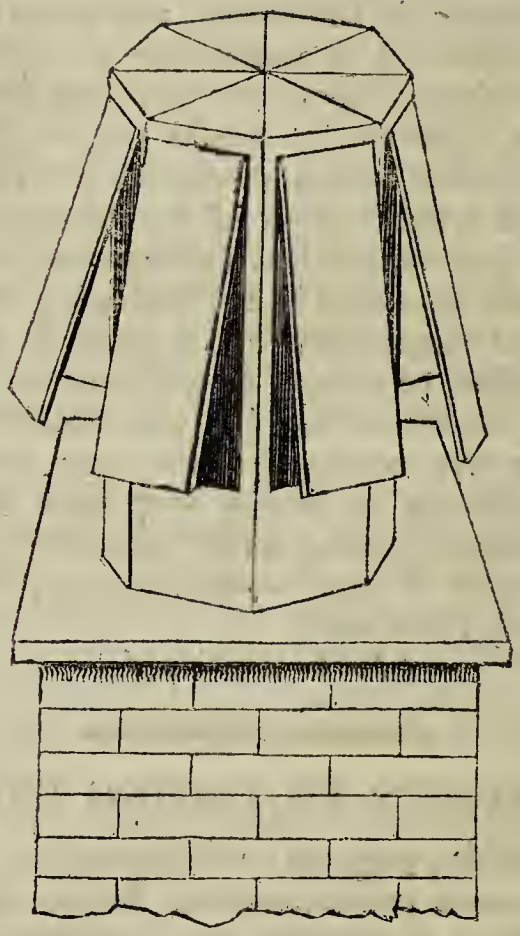
A A represents a common cistern.

B, the filtering stone, about three inches thick, (being hollow within) and placed on a strong stand, F, about three inches high; the top of the filterer is cemented on to the body of it, and is made of the same peculiar kind of white porous stone, through which the water filtrates with great rapidity, into the internal reservoir, from

whence it is drawn off at pleasure at any part of a house, (below the level of the water in the cistern) by means of a pipe and cock, C C, one end of which is inserted into the bottom of the filterer.

D, the air pipe, an indispensable appendage omitted in our former description.

E, the cock by which the common water may be drawn from the cistern.



SMOKE PREVENTIVE.

" To the Editor of the Register of the Arts and Sciences, &c.

" Maidenhead, November 4, 1824.

" Sir,

" Thinking it might be of service to many of your readers, I have taken the liberty to send you a description of a Chimney Top, for curing that great evil a smoky chimney. It consists of an octagon box, about 20 inches high and 10 broad, on each side of which there are doors, 2½ inches high, opening upwards, each door is connected with the opposite one by a strong piece of wire, making each hang about 25 degrees from the perpendicular. The same wind that would before have made the chimney smoke, will now close the doors on the same side, and consequently open those on the opposite side, through which the smoke will escape. Hoping that others may be benefited by it as well as I have been myself,

" I remain, Sir, your's,

" J. L. E."

" N. B. The hinges should be merely bits of leather, as others are apt to clog.'

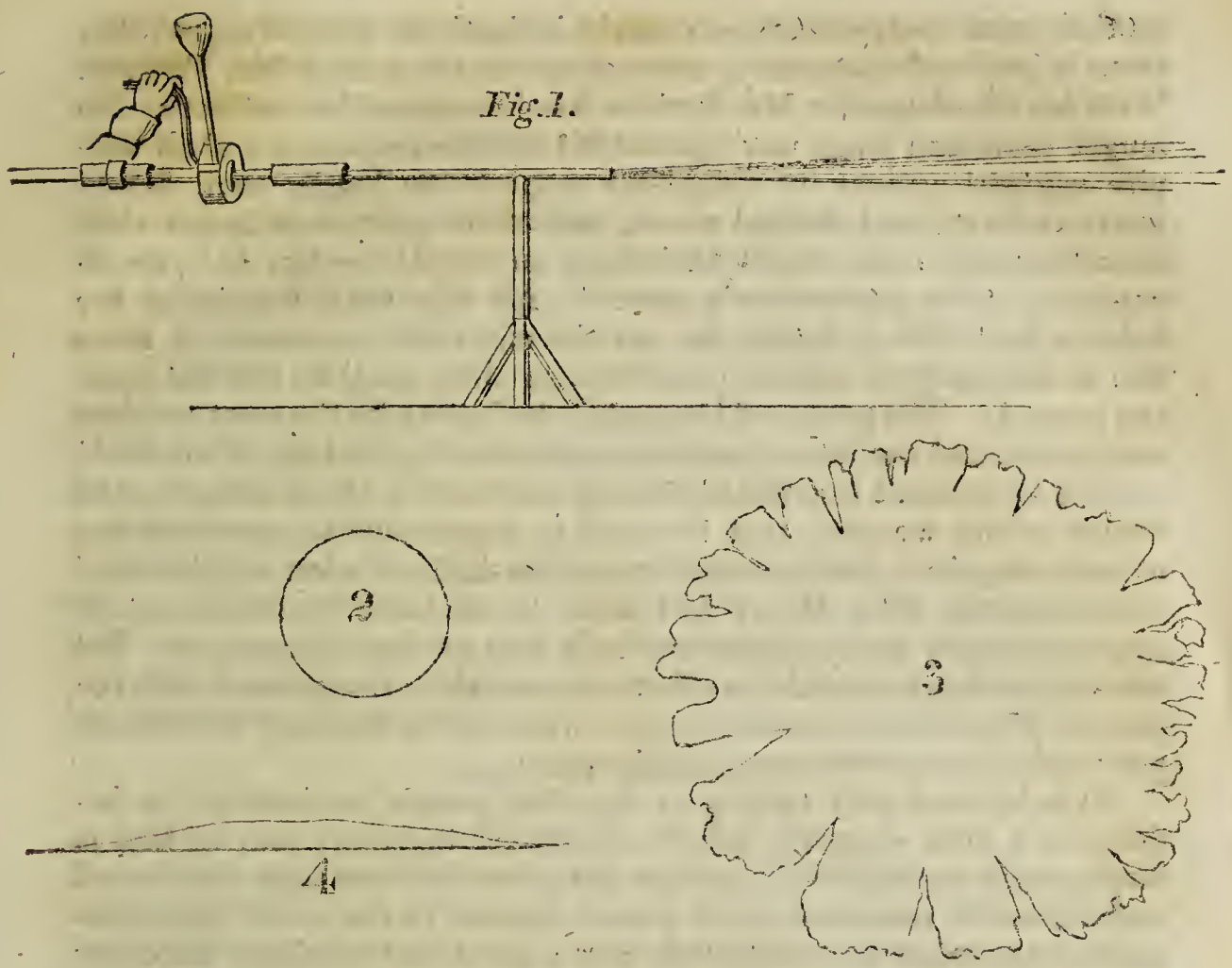


Fig. 1.

PERKINS'S "STEAM GUN."

It is, we believe, about three months ago that we were first present at an exhibition of this new application of the power of steam, and from that time to the present the account which we then drew up has been lying upon our table to make place for matter which we thought to have a greater call upon public attention. As several extraordinary reports, however, have lately been made by and about the "Steam Gun" as it is called, and as some of our correspondents have been firing their small-shot at us for what they are pleased to term the non-performance of our duty, we must e'en

"Shoulder our crutch, and shew how fields are *to be* won."

Divers magnificent designs have been chalked out, and sundry "Peace Societies" have been formed to facilitate the approach of the millenium, and to establish universal concord among the sons of men; but although they have hitherto turned out to be vapour, *vapour*, we think, is of all other materials destined to accomplish this perfection of universal harmony. Little do many of our worthy old dames think as they sit imbibing the "soft music of the spheres" (for spheres read tea-kettles) that the innocent and curling clouds that quietly ascend the chimney, is but a portion of that tremendous arm which might hurl death, tremor, and dismay, among the children of turbulence. But so it is,—and we hail, with feelings the most pacific and benign, the discovery of an engine more deadly and destructive than any which have record in the annals of the civilized world. It is asserted that nearly all the inventors of mortal weapons have perished

by their own contrivances—so surely is death its own avenger; but this, in justice to humanity, must never be the fate of Mr. Perkins. With his life-despoiler Mr. Perkins has introduced its antidote. No longer shall man wage war against his brother—no longer shall empire contend against its neighbour empire—no longer shall belted warriors be cut and slashed about, and all for glory—no longer shall brimstone and nitre assert their high prerogative—for, lo! 'tis all exploded, "its occupation's gone." All that shall remain of the battle's heat will in future be but the miserable remnants of some half dozen battered engines; and bullets alone shall be laid flat upon the ground. The power of kings shall be known by the most eminent mechanics, and the fate of nations be decided by the best Walls End!

We have heard it asserted that so confident is the inventor in the results of this weapon, that it would be practicable to construct one of such magnitude and power that cannon-balls of a ton weight could be *transmitted* from Dover to Calais, to the total demolishment of every sublunary matter discoverable in that ancient *département*. But whether he has been able to effect any amicable arrangement with the powers of gravitation and resistance which lie in the road we have as yet received no satisfactory intelligence.

It is by such silly talking as this that people are induced to indulge in a little waggery, however great the ingenuity may be that is displayed in an invention, and we too often find that from the absurd and incredible nonsense which passes current in the world, the exertions of the mind are frustrated, and a great and excellent discovery is made to appear ridiculous, and brought into disrepute. We have no question that this application of steam power by Mr. Perkins will lead to many and most important political consequences, and we as little doubt that the "Steam Gun" will stamp upon his name as great a notoriety as any one of the numerous discoveries of this ingenious mechanician. By such means, the natural boundaries and partial barriers of a state might be rendered perfect and impregnable, and hostile invasions be defied; and, where man could never constitute the strength or the defence of a nation, be an insurmountable bar to the attacks of a belligerent army. We can conceive no manual agency sufficient to overcome a country like Switzerland, for instance, where Nature has been prodigal of her "heaped defiances," when supported by the well-arranged disposition of such a means as this—and it will be strange indeed if, after so grand a suggestion to the potentates of this great world, a power of such resistless magnitude should be suffered to lie dormant.

The machinery of this Gun can easily be applied to the steam pipe of any boiler or generator under high pressure, and although exceedingly simple (as will be seen by the engraving) possesses some remarkable features of ingenuity, particularly in the swivel-joint, by which the operator is enabled to point, in any given direction, the muzzle of the gun through which the steam is allowed to rush.

The steam from the generator is permitted to rush through the apparatus as shewn, with such an amazing velocity as to be accompanied with a roaring noise; and a quantity of bullets being poured into the funnel, the machine is ready for action. By moving the handle the

bullets drop one by one into the chamber of the gun, from whence they are instantly and successfully driven by the impetuous force of the steam, with a report scarcely audible. The pressure of the steam, when we witnessed the exhibition, was equal to about 600lbs. upon the square inch, and the bullets were discharged at the rate of from two to three hundred in number *per* minute. The violence of the concussion of one of these bullets is so great, that it is completely flattened by the resistance of the iron target against which, they are "*fired*," as shewn by the *Fig.* 3, and by the transverse section, *Fig.* 4, bearing in its outline the proportions to the spherical bullet, *Fig.* 2. But when the pressure of the steam is increased to eight or nine hundred pounds upon the square inch, so great is the force, that the bullets are literally dashed in pieces against the target.

We understand that Mr. Perkins is constructing, or about to construct, a Gun, whose bore shall be capable of receiving a cannon ball (and a great bore we dare say it will be found), and there can be little doubt but the effects will be proportioned to the magnitude of the instrument employed.

[*Extract from the British Press.*]

"Sir,—"As your scientific readers will doubtless feel anxious to hear of what is passing with regard to the carriages now building by Mr. Brown, the celebrated inventor of the vacuum engine, I feel pleasure in being able to detail, for their information, so much of his mode of propelling a carriage with that engine as I have at present been able to ascertain.

"It appears that hitherto the engineers have erred considerably in vainly attempting to move a locomotive carriage with the same celerity up the steepest hills which would be used along level ground. This error Mr. Brown has, as far as I can understand, ingeniously avoided. He applies two sets of wheels to the axle on which his carriage wheels are affixed; and thus, in an instant, is enabled to increase the velocity at the expense of his power; or, when ascending a hill, to lessen his speed in the same proportion and increase his power, by which means he will move slowly up the hill, but with certainty; while his velocity on a level road may be four or six times greater than on an acclivity, and as the weight of Mr. Brown's engine can never be an obstacle, the hills may thus be slowly ascended, as well as the level roads swiftly traversed. The propelling power may, I believe, be applied either to the fore or the hind wheels, and of course the vehicle can be steered either in front or behind, according to circumstances.

"Mr. Brown also, I understand, intends to place all his machinery on springs, and to work the wheels by the application of straps or belts, by which contrivance any shaking or casual jerk cannot injuriously affect the machine.

"I hope I shall be able, on some future occasion, to renew this subject, so interesting to men of science and to the public; and

"*Paddington, Nov* 17. "I am, Sir, yours, &c. "G. G."

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. IV.—*(Continued from page 75.)*

ALQUIFOU, or ARQUIFOU, a name given in Cornwall to a sort of leaden ore, which has the appearance of antimony when broken. It is used by the potters to give a green varnish to their work, and thence is called potters-ore. When a small portion of manganese is mixed with alquifou, the varnish or glazing of the pottery assumes a blackish hue.

ALTERANT, or ALTERATIVE, in Pharmacy, that description of medicine which possesses the property or power of inducing an alteration in the body, and of disposing it for health and recovery from some indisposition, without occasioning any sensible operation.

ALUDELS are instruments for performing the process of *sublimation*. They are a kind of earthen pots open at both ends, and are made so as to fit one upon another; there are usually four, five, or more so placed, the uppermost being closed at the top to prevent the escape of the volatile *sublimed* products; which consequently become condensed, and adhere to the sides of the aludels. The flowers of sulphur, of benzoin, of arsenic, &c. were formerly so procured, but more simple apparatus is now general in chemical laboratories.—see SUBLIMATION.

ALUMINA.—One of the primitive earths of the argillaceous order. It constitutes the plastic principle of all clays, loams, and boles. The electro-chemical researches of Sir H. Davy have shewn that it is not an elementary body, but a metallic oxide. It is never found *pure* in its native state; with the acids it forms several species of salts; when combined with the sulphuric acid it forms that important article, ALUM, (which see.) It may be obtained pure by precipitating a solution of alum in twenty times its weight of water, by means of a solution of the carbonate of potash; the alkali uniting with the sulphuric acid, the alumina is precipitated in the form of a white spongy mass. But in those alums in which ammonia has been employed in the manufacture, (instead of potash, as usual in this country) the alumina may be separated by simple ignition, which dissipates its acid and alkaline constituents, leaving the earth pure.

Next to silex and lime, alumina is perhaps the most widely diffused earthy substance in nature. It is a constituent of almost every soil, and of almost every rock. From its giving the property of plasticity when mixed with other earths, it forms the basis of all porcelain, pottery, bricks, &c. From its powerful affinity for vegetable colouring matter it is extensively employed in the arts of dyeing and calico printing; in the preparation of lakes, and the manufacture of crayons.

ALUM, (or the SULPHATE OF ALUMINA) as described in the preceding article, is a compound substance, consisting of the earth *alumina* united with the sulphuric acid, a small portion of an alkali, together with the water of crystallization. M. Thenard's analysis of an alum made with potash gives the following proportions in 100 parts:

Dry acid	34.23
Potash	7.14
Alumina	12.54
Water	46.09
	100.

But a small portion of alum is found in a native state, and that mixed with heterogeneous matters. It is principally obtained by various processes from different minerals called alum ores. The purest of all aluminous ores is the sulphuretted clay of La Tolfa, near Civita Vecchia, from which the article called *Roman Alum* is made. The ore is white, compact and hard, whence it is called petra aluminaris; it is found in veins, and is separated from the rock by blasting. The stones are taken to the calcining oven, which is simply a hole dug on a rising piece of ground about five or six feet deep, and four or five diameter, having a lateral gallery communicating with the open air and the bottom of the furnace. On the bottom are laid faggots, and upon them the aluminous stones are skilfully placed so as to form a hollow vault; between the interstices of which the flame and smoke find a passage. The ore is considered to be sufficiently roasted when it has acquired the peculiar sweet astringent taste of alum.

The next process is that of piling the calcined stones in long beds upon a sloping floor, upon the lower side of which is a ditch of water, which extends its whole length. From this ditch the beds are frequently sprinkled with water, which as it drains from them runs back into the reservoir. The stones at length begin to crack and fall down, and in about forty days the whole is converted into a pasty mass, overspread with a reddish efflorescence. A leaden boiler is next filled with water and made hot, when the prepared ore is stirred into it by degrees, till a solution is obtained of the requisite strength; it is then drawn off in a turbid state into another vessel, wherein it is subjected to a very gentle heat, by which the superabundant water evaporates, the earthy matter is deposited, and the liquor becomes clear. Being reduced to the point of crystallization, it is drawn off into a square wooden vessel, eight feet high by five feet wide, and constructed so as to be taken to pieces readily. In this vessel the solution becomes crystallized in a few days. The mother water is then poured out, and used in the solution of fresh alum ore. The crystals being dried are ready for sale.

At Soltafara, a few miles from Naples, is a plain, at the top of a hill covered with a white soil, which exhales sulphureous vapours, and exhibits during the night the emission of a pale blue lambent light, in which state it has continued from the age of Pliny to the present time. The white clayey soil being constantly penetrated with sulphureous vapours, which together with the constant wetting by the rain and dew, the alum is thus produced by nature in large quantities, but in an impure state. It is therefore collected daily and lixiviated in large cauldrons, and afterwards crystallized in the usual manner as last described. The Abbé Mazeas procured from six pounds of the earth of the Soltafara, two and a half pounds of crystals of alums.

The most considerable manufactory in Great Britain is at Hurfleet, near Paisley, on the estate of the Earl of Glasgow. The next in magnitude is that of Whitby, an interesting account of which, and the processes, was published by Mr. Winter, in the 25th volume of Nicholson's Journal. The stratum of aluminous schistus is of great extent, and about twenty-nine miles in width. It is covered by a stratum of alluvial soil, sandstone, ironstone, shell and clay. If a quantity of the schistus be laid in a heap, and moistened with sea-water, it will take fire spontaneously, and continue to burn till the whole inflammable matter is consumed. The ore is broken into small pieces and brought to the furnace or kiln to be calcined. A bed of fuel composed of brush wood, upon which the ore is laid and piled up in the first place to the height of four feet, when the fuel is lighted. Fresh portions of rock are afterwards added, pouring it on the pile continually until it reaches the height of from 90 to 100 feet, with its base nearly 200 feet square, and containing in solid measurement about 100,000 yards of ore. One hundred and thirty tons of this calcined schist produces upon an average one ton of alum. The calcined mineral is digested in water in large pits, from whence the liquid is drawn into cisterns, and afterwards pumped upon fresh quantities of calcined mine. The strong liquor is drawn off into settling cisterns, where the sulphate of lime, iron, and earth are deposited. In some works the liquid is boiled to aid the purification. The liquid is next poured into leaden pans, 10 feet long, 4 feet 9 wide, 2 feet 2 inches deep at one end, and 2 feet 8 at the other, for the greater convenience of emptying. In these pans the liquor is concentrated at a boiling heat, then emptied again into settling cisterns, where a quantity of the muriate of potash is added, and then allowed to settle again for the space of two hours, when it is run into coolers to be crystallized. After standing four days the mother waters are drained off, to be pumped into the pans on the succeeding day. The crystals of alum are then washed in a tub and drained. They are next put into a leaden pan with as much water as will make a saturated solution at the boiling point; when this is effected it is run off into casks. In ten or fifteen days the casks are unhooped, and taken asunder; round the sides the alum is found in solid cakes, but, in the inner cavity, in large pyramidical crystals. This last process is called roching.

[*To be continued.*]

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Mexican Mines.—The enormous premiums of from six to seven hundred pounds per share, which have recently been given for the New Mexican Mining Company's Shares, will cease to excite surprise when the extraordinary success which has attended similar undertakings in the same country is considered, notwithstanding they were conducted in the clumsiest and most unscientific manner.

That part of the Mexican mountains which at present contains the greatest quantity of silver, is contained between the parallels of

21 and 24½ degrees; and it is remarkable that the metallic wealth of Mexico and Peru should be placed at almost equal distances in the two hemispheres from the equator.

The mean produce of silver of the mines of Mexico, annually exported from Vera Cruz, amount to 2,500,000 marcs, which are equal to two-thirds of the silver annually extracted from the whole globe. The quantity of gold is comparatively small, the proportion being as 1 to 23 of silver. The Mexican gold is for the most part extracted from alluvial grounds, by means of washing. The same metal is to be found either pure or mixed with silver ore, in the greatest number of veins which have been wrought in Mexico: there being scarcely a silver mine which does not also contain gold. The gold of Mesquital is considered the purest.

From the investigations of the Director General of the Mines of Mexico it appears that the *average* produce of 100lbs. of the ore is from 3 to 4 ounces of silver. The mine of Valenciana yielded to its proprietors, for a long series of years, an average of about £100,000 net profit per annum; which latterly encreased to a larger amount. The sum annually laid out in working it amounts to about £187,000. The consumption of gunpowder alone costing upwards of £16,000. The number of persons employed (men, women, and children) is 3100. The superintendants of the mines visit the subterraneous operations daily *carried on by men who have a sort of saddle fastened on their backs, and who go by the name of little horses (cavallitos).*

The mine of Parissima has scarcely ever ceased since 1788 to yield an annual net profit of 200,000 piastres (£43,752 sterling), while the expenses of working it have not amounted to more than 80,000 piastres.—*Humboldt.*

(To be continued.)

Plate.—Dr. Geitner a skilful chemist at Schneeberg, in Saxony, has invented a new metallic compound, the qualities of which very much resemble those of silver. It is malleable, and is not subject to rust or tarnish. Candlesticks, spurs, &c. have already been fabricated with this composition, and it is highly probable that the discovery will lead to great alterations in the manufacture of plated goods.

Combustion of Iron by Sulphur.—This experiment is thus performed by Dr. Hare. A Gun-Barrel being made red hot at the butt end, a piece of Sulphur is thrown into it; then by closing the mouth with a cork, or by blowing into it, a jet of sulphurous vapour is produced at the touch-hole, to which if iron wire be exposed it will burn as if ignited in oxygen gas, and fall in fused globules of protosulphuret of iron.

Rio Vinagro.—M. Humboldt has lately communicated to the Academy of Sciences, that M. M. Boussingatel and Rivero, who are exploring the Cordilleras of New Granada, have analyzed the waters of the River called *Rio Vinagro,* and have found them to contain the sulphuric and hydrochloric acids in a free state.

Red Snow.—Professor Agardh, of Lund, has lately ascertained the singular circumstance that the *red snow* is an alga and that it is

found not only upon all Alps in the spring, but also on limestone in Sweden during the summer. It had been observed by Linnæus, and then described as a lichen by Baron Wrangel. Having had the opportunity of examining both the lichen and the red snow from the arctic expedition, Professor Agardh has found them to be absolutely the same.—*Brewster's Journal.*

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1284.

POTATOES.—To the person who shall, in the year 1824, cultivate the greatest quantity of land, not less than fifty acres, with potatoes, of such qualities as shall be fit for the use of the table in the months of April, May, and June, 1825.—The Gold Medal, or Thirty Guineas.

PRESERVING CABBAGES.—To the person who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for supporting and fattening sheep and neat cattle during the months of February, March, and April.—The Silver Medal.

PREVENTING BLIGHT.—To the person who shall discover to the Society the most effectual method of preventing the blight or ravages of insects on fruit trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments.—The Gold Medal.

RECENT PATENTS.

FURNACE FLUES.—To H. Jeffries, of Park Street, Bristol, for a new invented improved flue or chimney for furnaces and other purposes.—Sealed October 7, 1824.

STEAM ENGINES.—To Pierre Alegre, of Colet Place, Commercial Road, Middlesex, for an improved and more economical method of generating steam applicable to steam engines, and other purposes.—Sealed October 7, 1824.

CALICO PRINTING.—To Matthew Bush, of West Ham, Middlesex, for certain improvements in the apparatus for printing calicoes and other fabrics.—Sealed October 7th, 1824.

HORSES SHOES.—To J. T. Hodgson, of William-street, Lambeth, Surry, veterinarian; for certain improvements in the construction of shoes, or substitutes for shoes for horses and other cattle, and in the method of applying them to the feet.—Sealed October 7th, 1824.

SPINNING FLAX, &c.—To Philip Chell, Esq. of Kensington, Middlesex, for improvements in machinery employed for drawing, roving, and spinning flax, wool, silk, &c.—Sealed October 14th, 1824.

TO OUR READERS AND CORRESPONDENTS.

Dry Rot, &c.—Mr. Gregory informs us that an error was made in the engraving of one of the figures which accompanied his communication inserted in our last number. He states that "in the end view of the log (page 87) *b b* will be the moulding of the timber after the log has been sawn down the middle." —Mr. Gregory likewise takes the opportunity of correcting an error of the press which occurred in a former communication, viz. at page 310, Vol. I. for "*ex*ternal decay," *read* "*in*ternal decay."

Our Huntingdon Correspondent's Letter we are obliged to defer till the next number.

The improved pens have appeared before.

Received letters from—Mr. H.....y,—Minus,—A. B. C.—Listos,—Edward Hay,—F. F. F.—James,—I. S.—Mr. Whiston,—James and W. Roberts, —I. B—and L. W.

We are extremely sorry that the subject of Mr. Cole's book does not come exactly within the scope of the "Register of Arts." We should else be happy to have given every publicity to a meritorious discovery.

The Letter on "Wheelage" is mislaid, will be inserted next week.

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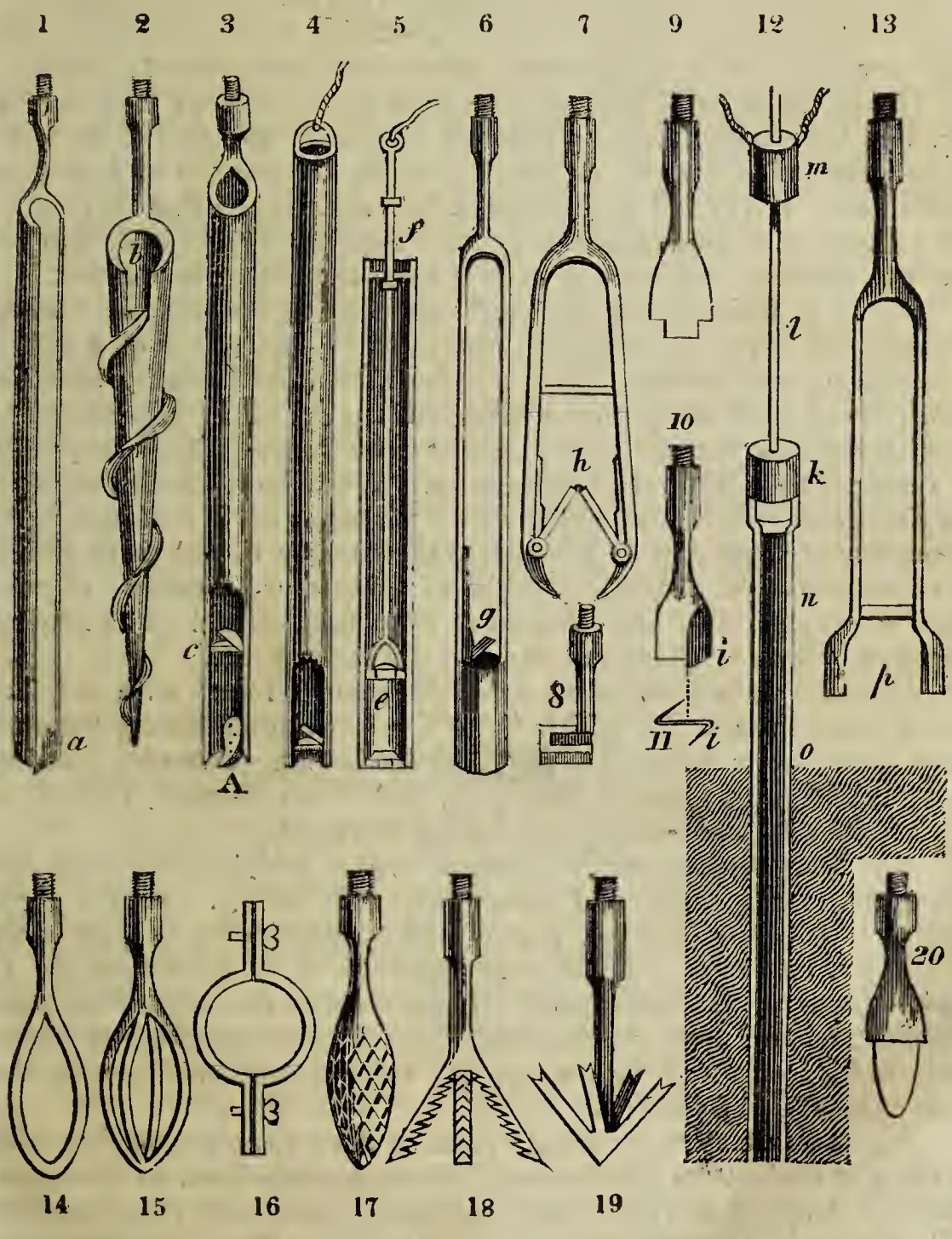
REGISTER

OF

THE ARTS AND SCIENCES.

No. 32.] SATURDAY, DECEMBER 11, 1824. [Price 3*d*.

CONTENTS.—Good's Patent Implements for Boring the Earth, 114,—H. B. Leeson's Self-acting Blow-pipe, 117,—Veterinarius on Horse Shoeing, 118, Royal Society, 120,—Miller's Patent Printing Machine, *ib*.—Steam Washing Company, 123,—Encyclopædia of the Useful Arts, No. V. 124.—Letters of Enquiry, 127.—Fishing through the Ice,—On Gunnery,—Patents and Correspondents, 128.



GOOD'S PATENT IMPLEMENTS FOR BORING THE EARTH.

GOOD'S PATENT IMPLEMENTS FOR BORING THE EARTH.

The economical process of boring the earth for the purpose of obtaining water, instead of the digging of wells, being now very extensively and successfully adopted; and it being a subject upon which much enquiry still exists, we have the pleasure of laying before our readers an account of the recent patented improvements in the art by Mr. John Good, of Knightsbridge.

In our 13th number, Vol. 1, was inserted a communication from a correspondent, giving an accurate detail of the modes of boring the earth, together with a description of the instruments at that time generally employed. The manner of proceeding, therein described, being the same as in the present instance, (the difference being merely in the instruments) we must refer our readers to that account, and limit ourselves to a description of the patented improvements only.

It will be noticed that all the instruments except four have a screw at their upper ends, which are tapped to one thread so as to fit uniformly into the rod or rods by which the process of boring is conducted. Every rod is screwed in like manner, so that any number of rods may be connected by their screws, end to end, and on the lowermost of the series of rods is fixed the boring implement.

Fig. 1 represents the principal instrument employed for boring through soft earth, such as clay, loom, chalk, &c.; it is of a cylindrical form, with an opening or slit down its whole length, equal in width to one third of the circumference of the cylinder; this construction having been found by the patentee to be the best suited for earths of a compact but not very hard nature. When however the earth is very soft and yielding, an auger with a narrower slit is provided, duly proportioning that part to the degree of tenacity of the earth which is to be extracted. At the bottom of this auger, a cutting edge is fixed at *a* by screws, and adapted so as to take off and on as may be required, either to change or sharpen the instrument.

Fig. 2 is an implement of a hollow conical form, with a spiral worm wound round it; which is for the purpose of boring through very loose sandy soils; the sand, as the boring proceeds, passing along the inclined plane of the screw, until it arrives at *b*, when it is discharged into the hollow receptacle of the cone.

Fig. 3 represents another form of auger, which is employed for extracting mud, sand, and other very soft matter. It is a close cylinder, with a valve at *c*, part of the cylinder being broken away to bring it into view. It has a cutting edge, A, at bottom, as *fig.* 1, and is employed in like manner. Upon turning this auger, the soft, yielding, or fluid matter passes through the valve and fills the cylinder, which, on being drawn up, the valve closes, and secures the conveyance of the contents.

Fig. 4 is a close cylindrical vessel of the nature of a bucket with a valve at the bottom (as shewn). Having a rope fixed to the upper end it is dropped down the hole, and being alternately raised and let fall, it acts as a pump, to extract the liquid or floating matter that

may be contained in the hole. *Fig.* 5 is another pumping tool, more complete than the former, the cylinder being fitted up in the manner of the common lifting pump with a rod and bucket *e*. In this instrument the rod is lifted at every stroke instead of the whole apparatus, (as in *fig.* 4,) and has the preference more particularly in great depths. There are two stops and a guide piece at *f* to limit the extent of the strokes.

Fig. 6 is an instrument for extracting rods when broken in the hole: in its upper part it is like a pair of tongs, having at the lower end a cylindrical tube, and above it, at *g*, a chisel-edged tongue, which is pressed downwards by a spring. Upon lowering this instrument into the hole, the upper end of the broken rod passes through the tube, pressing back the tongue, which holds it fast and prevents its returning, so that it may then be drawn up out of the hole. This last mentioned form of instrument is sometimes employed with two pressing edges or tongues, similar to those shewn in *fig.* 7, at *h*, which is employed for precisely the same purpose; the operation and construction of which will be best understood by referring to the engraved representation. *Fig.* 8 is another tool for raising broken rods, and adapted so as to lay hold of the rods by means of its claw underneath their joints, and by that means be drawn up.

Fig. 9 is an improved chisel punch, employed for perforating stony matter by repeated pecking; the projecting middle piece which strikes first, the patentee finds to be of great advantage; the blow is more effectual, and the fractured stone is thereby more easily displaced. *Fig.* 10 is another form of chisel, for chipping away hard substances, and by its peculiar construction likewise adapted to the operation of boring: the sides of the instrument are bent in an angular form so as to present cutting edges, which rounds and perfects the hole as it is turned by the workmen. Its peculiar form is shewn by the edge view, *fig.* 11;—*i*, *fig.* 10, and *i*, *fig.* 11, representing the same parts.

Fig. 12 is the apparatus employed for ramming down the iron or other metal tubes which line the perforation after being completed. A block of wood, *k*, has an iron rod, *l*, fixed perpendicularly in it; on this rod a weight, *m*, is made to travel or slide by a hole being passed through it. The wooden block being fitted into and over the edge of the upper end of the metal tube *n*, the weight is raised by cords, and let to fall upon the wooden block, thereby forcing down the pipe. When a piece of tube has thus been driven down even with the surface of the earth shewn at *o*, another piece is fitted into it, and the operation of ramming down renewed as before. Another instrument for this purpose is sometimes employed, of the shape of an acorn, shewn at *fig.* 20; which is made to screw into the end of the perforating rods, and being let down into the hole, the lower part of the acorn tool enters the pipe, and the projecting rim resting upon the edge of the tube admits of its being forced down with an even bearing pressure.

Fig. 13 is an instrument constructed like a pair of tongs, armed at each end with two projecting cutting edges, as at *p*, which, on being turned round, cut like the sides of an auger or gimblet, and are thus employed in paring or widening the perforation.

Fig. 14 is a tool formed like a double bow, employed for pressing out any indentations that may be accidentally made in the lining tubes, which are sometimes made of a soft metal, such as lead, or of a thin substance, such as copper or tinned sheets. *Fig.* 15 is another tool for the same purpose, forming a quadruple bow; it is adapted for rubbing down smaller indentations, or to finish the work of the double bow tool. They are both fixed like the other tools by screwing into the end of the rod or series of rods, and operate by simply turning them round.

Fig. 16 is a pair of circular clams employed for holding or turning round the tubes when being sunk; being fastened together by means of screws, the pipe may be firmly held within their grasp.

Fig. 17 is a tool of a pine-apple shape, used for drawing up a piece of tubing when required. It is jagged all over like a rasp, and being struck down forcibly within the tube, it takes fast hold, and allows of its being drawn up. *Fig.* 19 is another implement for effecting the same object; it is a kind of spear with four prongs; being forced down, the points stick into the tube and enables it to be withdrawn.

Fig. 18 is a triangular instrument with jagged teeth used for getting up loose stones which sometimes lie in the hole and impede the work; upon being struck down the stone becomes fixed between the notches of the prongs, and is then extracted.

It is perhaps necessary, to a clear comprehension of the matter by some of our readers, to describe another part of the arrangements of the patentee, as described in his specification, although there is nothing of novelty in it. At twelve or more feet from the ground a stage is erected, over the hole. Upon this stage is fixed a double-handled winch, with tackle complete for two or more men to work, in raising or lowering the instruments, &c.; which become of great weight when the perforation has proceeded to a considerable depth. Between this stage and the ground the men are employed either in turning round the instruments in the act of boring; (which they do by the help of iron levers fastened crosswise to the boring rod by means of screw bolts) in screwing or unscrewing the rods and tools, or in the various other operations before described.

It does not appear that the patentee has made any decided improvements in the usual practice of boring the earth. The new instruments, (which are ingenious and well adapted to effect the purposes intended), are employed in the same manner as heretofore, by screwing them on to the end of the series of rods, and the unscrewing of every rod as often as they are drawn up, *just the same as the operation of boring has been conducted for centuries past.* The method proposed by our old correspondent, L. H. at page 196, Vol. 1, for superseding the necessity of this tedious and laborious process, seems to us to be particularly deserving of notice. If it be practicable, and we see no reason to doubt it, the adoption of it would be attended with the advantage of saving at least three fourths of the labour and consequent expence. We should be glad to learn if L. H.'s method has yet been put into practice.

DESCRIPTION OF A SELF-ACTING BLOW-PIPE, BY MR. H. B. LEESON.

It has, I believe, before been observed, that bottles of Indian rubber might be expanded to a considerable size by condensing air into them :—I am not however, aware, that bottles so filled with condensed air have been applied to the purposes of a Blow-pipe.

The bottles I make use of vary in weight from half to three quarters of a pound, and may be readily procured at the stationer's. To prepare them they should be boiled in water till completely softened, which, if they are put into water already boiling, will generally be accomplished in ten minutes or a quarter of an hour. They must then be taken out and suffered to cool, when a brass tube may be fitted into the neck of the bottle, having a small cock screwed into it at one end, by which it may be connected with the condensing syringe, and to which the Blow-pipe jets may be attached. There should be a milled projection on the side of the tube, for the purpose of more firmly attaching the bottle to it, which may be effected by fastening a ligature of waxed string round the neck of the bottle on each side of the above mentioned projection.

The bottle must then be filled with condensed air. After a few strokes of the syringe a blister will be observed to form, which will gradually enlarge till the greatest part of the bottle (which must be selected uniform in substance, and free from defects,) has extended to a similar substance. The condensation should not then be continued farther.

Bottles of the size I have mentioned will generally extend from 14 to 17 inches in diameter without bursting; and I have occasionally extended them much beyond these dimensions; but in this the operator must, of course, be entirely directed by his own observation.

The Indian rubber varies in its quality. There is one sort which appears of a blacker hue before extension, but becomes very thin and almost transparent on condensing air into it, whilst there is another sort having a browner colour, which is much less yielding in its substance, and cannot be extended to the same thinness as the former.

I have found both sorts to answer my purpose, but the above observations may be useful in determining the quantity of air which may be condensed into the bottles with safety.

To apply these bottles when filled with condensed air, nothing more is necessary than to remove the syringe, and in its place to screw on a jet of such bore as may be required. On opening the cock the air will be expelled by the elasticity of the Indian rubber and its own condensation, in a strong and uniform stream, which, in bottles of the size I have mentioned, will continue from twenty minutes to an hour, according to the size of the jet.

When once prepared, the bottles may be constantly expanded to the same dimensions without any danger of bursting. When the air is exhausted, the bottles will be found somewhat enlarged in di-

mensions, but may again be contracted by holding them before a fire, or by a few minutes immersion in boiling water. This, however, is unnecessary, since no subsequent inflation will be found to increase the size of the bottle any further, and I have used the same repeatedly without any apparent diminution of its elastic powers.

The principal advantages of this Blow-pipe are its great portability, and length and steadiness of action, (in which I consider it much superior to the hydraulic Blow-pipe) together with the perfect liberty at which, when properly mounted, it leaves the operator's hands.

This Blow-pipe is applicable to any of the gases, and may, I conceive, be applied with advantage to contain the explosive mixture of oxygen and hydrogen, as no inconvenience can possibly accrue from its bursting, beyond the loss of the bottle.

This Blow-pipe may be supplied with air or gas during an experiment, by having a separate communication for the syringe into the piece of tube before-mentioned, and this will enable the operator to continue his experiments for any period of time.

Blow-pipes on this construction may be procured, very neatly and conveniently mounted, at Mr. Newman's, 8, Lisle-street, Leicester-square.—*From the Quarterly Journal of Arts.*

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"As a constant reader of your widely circulated Register, and from the sincere wish I have for the extension of improvement in the Arts and Sciences, and my peculiar desire for the establishment of truth instead of error, I beg leave to solicit your kindness in allowing the insertion of this Letter. Though boasting of no superiority on the part of originality in these my proposed remarks, still I feel confident, and do really believe that the method of Shoeing suggested by Mr. Dickenson is calculated to defeat the designs of nature rather than improve them. For, says he in his quotation, 'it is evident that a horse in a state of nature presses with 'the whole surface of his foot upon the ground.' Now I contend this is not the case, but that the exterior rim of the foot is designed for no other purpose than to sustain the weight of the horse, and that the frog indubitably participates in a small degree with the same office, though notwithstanding I have no hesitation to affirm that too much even upon this elastic cushion is prejudicial and injurious; therefore, the idea of fixing a plate of iron upon this part, for the intention of pressure alone, must be extremely erroneous and absurd, for the sensible frog never can bear considerable compression without some derangement in its functions. Secondly, I would beg leave to remark how very destructive that plan of shoeing must be which places pressure upon the sole. Why I conceive if a person wished to lame his horse, the quickest and most certain way would be to adopt the system which this gentleman so emphatically recommends as an enlightened system, Now, any rational being who is capable of discrimination

and judgment must think, that compression upon any sensitive part will create irritation and pain; therefore I presume there can be no difficulty in demonstrating the impropriety of such a mistaken adoption. And what a very strange reference he makes to corroborate his theory, for, says he, 'the reason that a farm horse never has 'contracted and brittle feet is, because the clog of earth makes an 'equal pressure upon the foot, and by absorption moistens the sole.' Now moistening the sole is very good argument, but to assert that the benefit thereby is ascribable to the equivalence of bearing is most ridiculous and foolish. I am inclined to believe, and I feel convinced that the innumerable quantity of crippled horses we observe every day, is owing, not to the common mode of shoeing, but to the great concussion which they are obliged to sustain in their laborious exertion. Notwithstanding I do not insinuate there are no connecting causes, as we are certain there are, which are confinement in a close stall with hot litter under their feet, and so on; this occasions the horny box to contract by its fragility, and squeeze in the sides of the foot, and keeps up a continual irritation which nothing but moisture can correct.

"But then there is another thing to be noticed,—How can the pummied foot be benefitted by this proposed shoe? Would he have the weight of a piece of iron upon a part which can scarcely bear the pressure of a thumb? Why surely he cannot advance any plausible argument in support of such a false notion as this! Surely he cannot expect the appreciation of an enlightened public for such a system as this. No, no, pretty well if he can get readers to glance upon it for a second, (it requires no more time to detect its absurdity) as it is perfectly improper. I do not make use of these sarcastic epithets to depreciate the abilities of the author, as he acknowledges his deficiency in veterinary science, but merely with a view to expose the dangerous inaptitude of such a method of shoeing. Respecting the principle of the sponge I must certainly coincide with him, because it preserves the natural pliability of the horning box, and gives greater spring to the mechanism of the foot; but then I think there might be a cheaper manner than a sponge, for surely the foot may be soaked in a pail of water four or five times a day, which is equally as well. It is thought by some that curving the toe is a great improvement in shoeing, but I must even in this case fall in coincidence with that great luminary, Mr. White, in asserting it most absurd imaginable; at any rate there is no necessity for lowering the heels, as that would inevitably distress the flexor tendons, and do harm in that way.

"It is not my intention to enlarge on this subject any further, but I hope the indulgence of the Editor will permit these my humble sentiments to be inserted in his Register, as I am extremely desirous to annihilate the principles of error, and establish those of truth. I hope I do not egotise when I venture to assert that the observations I have here made will be sufficient to do away with in the course of time that strange improvement, pressure upon the sole, and that laughable jargon, equivalence of bearing.

"*Huntingdon.* "VETERINARIUS."

ROYAL SOCIETY.

Tuesday being St. Andrew's Day, the Royal Society met at their chambers in Somerset House, for the purpose of electing the president, officers, and counsel for the ensuing year, Sir Humphrey Davy read an elaborate and highly interesting report of the council on the progress of natural science during the last twelve months. The society then proceeded to the ballot, and Sir Humphrey Davy was unanimously re-elected to the office of president. as were Davies Gilbert, Esq. M. P. and W. T. Brande, Esq. to the offices of treasurer and secretary.

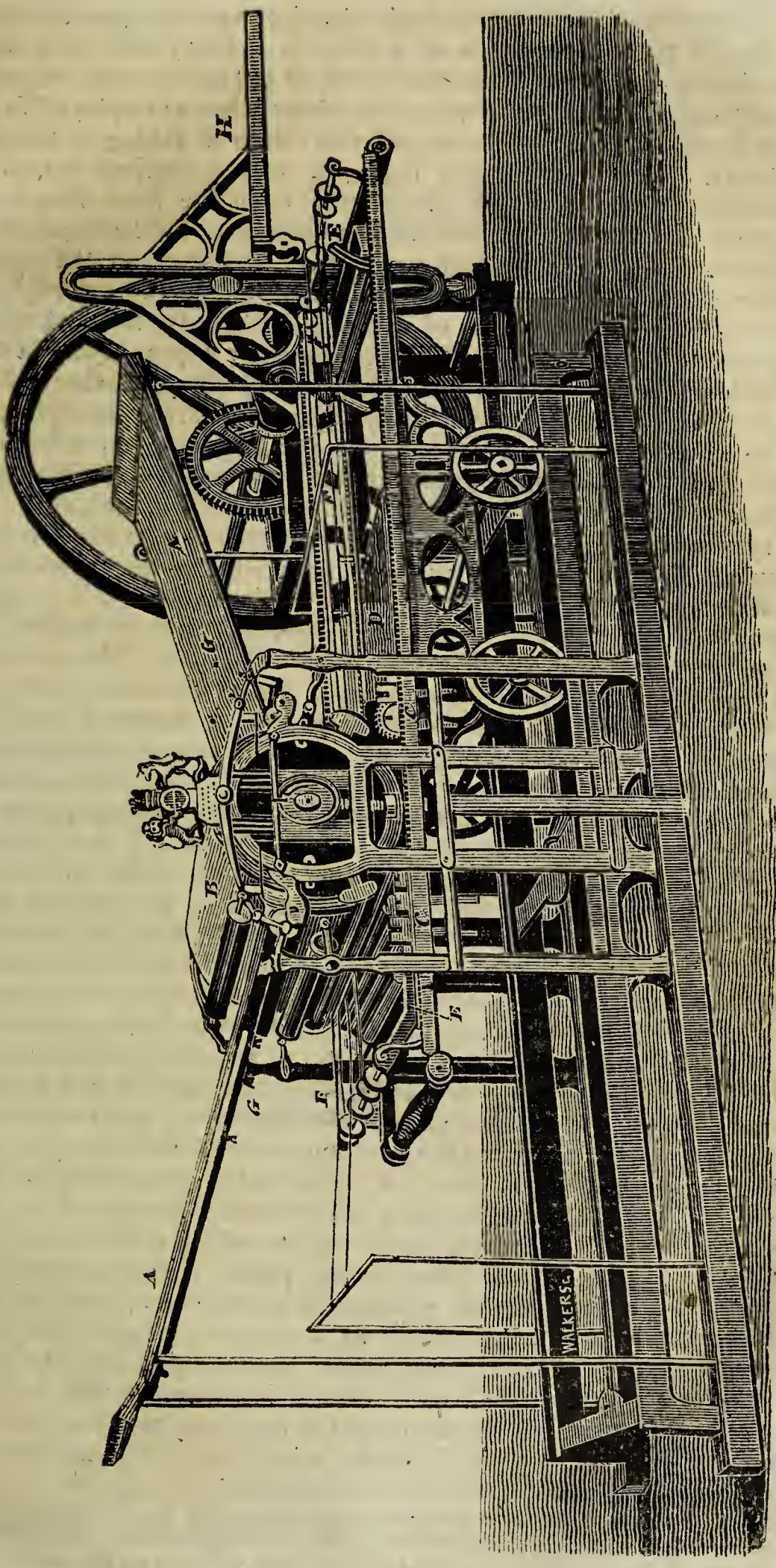
The following is the council for the ensuing year :—Sir H. Davy, Bart, president : William Thomas Brande, Esq. secretary ; Samuel Goodenough, Lord Bishop of Carlisle, vice-president ; Major Thomas Colby ; John Wilson Croker, Esq. ; Davies Gilbert, Esq. treasurer, vice-president ; Charles Hatchett, Esq. vice-president ; Sir Everard Home, Bart. vice-president ; John Pond, Esq. ; William Hyde Wollaston, M. D. vice-president ; Thomas Young, M. D. secretary for correspondence ; William Babington, M. D. ; Francis Baily, Esq. ; John George Children, Esq. ; Viscount Dudley and Ward ; Captain H. Kater ; Thomas Andrew Knight, Esq. ; Alexander Mac Leay, Esq. J. F. W. Herschell, Esq. secretary ; Sir T. Stamford Raffles, Knt. ; and Edward Adolphus, Duke of Somerset.—This Council will continue till St. Andrew's Day, 1825.

MILLER'S PATENT PRINTING MACHINE.

Whatever tends to facilitate the operation of that primest of all moral powers "the Press" must necessarily be deserving of the highest consideration. When we look to the influence which a general diffusion of literature and the promulgation of opinion must produce upon the habits, the feelings, and the political economy of a country, we cannot but be struck with the magnitude of the subject and with the importance of arriving at an available means by which so desirable an object can be attained. Manual exertion, unaided by mechanical power, could do but little towards the extension of distributive knowledge; because the labour and the time employed in attempting, would, if not rendered abortive, be inadequate to effect the *end* to any generally good or useful amount. As an engine of vast and illimitable power therefore the printing Press necessarily becomes a subject of serious consequence; and every improvement in either the disposition of its parts, or the construction of its machinery which goes to accelerate or multiply its offices, deserves the promptest examination and most liberal praise.

The annexed Engraving will be sufficiently understood by those who are conversant with the subject of it ; and we avail ourselves of the descriptive statement with which we have been furnished in illustration of the principles and methods which the Patentee has adopted.

MILLER'S PATENT PRINTING MACHINE.



This Machine is set in motion by the power of one man,* and is adapted to print one side of a sheet at a time, and with such astonishing velocity as to produce upwards of two thousand impressions per hour, with the attendance of two boys who are employed in laying on the blank sheets of paper, and two others for taking off the printed sheets. The form of types is placed upon a carriage which slides backwards and forwards along rails upon the fixed frame of the machine, so as to pass beneath the surface of the large printing cylinder. The blank sheet of paper being first laid on the tympan is carried down between rollers and tapes under the cylinder, which presses it upon the form of types and prints it, from whence it is conducted forwards and delivered on other tapes, where a boy is stationed to take it off. The tapes which carry the sheet of paper along under the surface of the cylinder, are narrow enough to lie in the spaces between the pages for printing, and do not therefore prevent the sheet from applying itself to the types, although they pass entirely across its surface, so as to keep it in place. These tapes are arranged over small pulleys, which can be fixed at any required distance apart, so as to accord with the spaces between the pages for printing different kinds of work, such as folios, quartos, octavos, &c. The mode of procuring register is by points, which can be moved with every facility in any direction. The machine has two distinct sets of inking apparatus, one at each end, being so arranged as to furnish and distribute the ink by means of elastic composition rollers upon the form of types, as it moves backwards and forwards underneath them. The reservoirs of ink, from which the rollers are supplied, are fixed on each end of the carriage; near which are also other rollers to distribute the ink uniformly over the surface of the inking rollers. The rollers being made to pass twice over the types before an impression is made from them, produce an effect in inking them equivalent to what would be afforded by passing the common inking roller four times over them, which is all that is usually deemed necessary to distribute the ink equally over the types, so as to render the impression clear and uniform. The feeding roller is supplied with ink by means of a trough and regulating scraper. While the impression is being produced, the receiving roller is brought in contact with the feeding roller while in motion, and receives a sufficient quantity of ink for the next impression, while the type carriage is returning to its first position. The distributing roller, whilst revolving, has at the same time a lateral motion given to it in order to distribute the ink over the whole surface of the composition rollers. The mechanism by which the moving power is communicated to the Machine is constructed on a principle entirely new, and the machine is worked with as much facility as a common printing press. The power of the pressing cylinder and of the inking rollers can be regulated and adjusted with mathematical accuracy, so that a strong or a light impression, as the nature of the work may require, can be given with the utmost nicety. From the simplicity of the construction of

* We have seen the machine in operation; and have witnessed that the power of one man, applied to the winch of the fly wheel, was sufficient to throw off the impressions with perfect accuracy, and with the rapidity stated.

the Machine, and the very small degree of friction to which it is subjected, it is not liable to get out of order. When in full action it can be stopped instantly by one of the boys employed in laying on the sheet. The Machines are so easily worked, that a steam engine of the power of two horses only would be sufficient to actuate ten of them.

REFERENCES TO THE ENGRAVING.

A A—The tympans, on which the blank sheets are laid.
B—The printing cylinder.
C C—The inking rollers.
D—The form of types on the carriage.
E E—Reservoirs of ink, from which the rollers are supplied.
F F—Tapes, which convey the sheet under the cylinder, in the direction it has to travel.
G G—Register points.
H—The Mechanism which communicates the moving power to the machine.

THE STEAM WASHING COMPANY.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"As one of the marvellous improvements of this most philosophical of all possible ages, I beg to call the attention of yourself and of your readers to a subject which I have not yet stumbled upon in your little publication; and I cannot restrain the expression of my surprise that you should have all this while overlooked so important a notification: I allude to the recent birth of a truly scientific bantling, conceived by the united efforts of a number of old gentlewomen, and baptized as *The Steam Washing Company*. Most truly has it been asserted, that steam is yet but in its infancy, and nothing can more completely evidence the universality of its power than its effectual renovation of diapers, and dishcloths, and various under garments, faded by the hand of time and otherwise.

"Your readers may have seen a beautifully bleached caravan, impelled by four finely equipped greys, bedecked with a magnificent profusion of brass and blue ribbons, and controlled by a sleek-faced knight, mounted on a leather throne. Little do good people conceive what those milk white pannels conceal; and far be it from me to raise the veil! Peradventure it may not be generally known in what way the materials are operated upon. *Ecoutez.*—The unlucky linen is twisted upon rollers, which, turning and twining upon their axes, in a chamber of steam, and revolving with the most astonishing rapidity, rub, scrub, and scour it away most gloriously, much to the satisfaction of its owners, and to the infinite fun of sundry chuckling dogs in the shape of linen drapers, &c. whose eyes are twinkling with mercenary delight, and a prospect of filthy lucre. When sufficiently steamed, (and imagine, sir, the horrible sensations of the steam, as rushing with velocity to the embraces of its newly-acquired acquaintance, it on a sudden discovers—fogh!) it is taken from

this place of execution, to undergo the fond and endearing pressure of rollers of heated iron, which, with a versatility of talent utterly astonishing, perform the office alike of smoothing and polishing plain surfaces, complicated plaitings, and delicate fretwork. This performance is none of that little minded description which pays attention to minute matters, but is executed with a masterly hand; and, if there be perchance any little obstruction in the nature of flounces, frills, tucks, and gatherings, it nevertheless goes on freely and nobly, unmindful of a few inconsequential and minor tears, rents, and breakages, and settles the business with a dispatch, rapidity, and neatness, quite inconceivable.

"But it is not my object to dilate upon the process employed in effecting this delectable description of purity. The means may be purely mechanical, and I dare say the Engineers who have been brought into requisition have, like honest tradesmen as they are, done their duty; and I hope they have been paid for it. What I advert to is the object of the originators, what that object is must, I think, be perceptible to a blind man, and certainly the Steam Washing Company appears to me a most doughty exemplification of that system of "Joint Stock" jobbing which is now so much in vogue. The proprietors must no doubt be delighted with their grey mares and blue ribbons, and I really trust that these kind-hearted and easy-minded souls may secure a rich dividend bye and bye—*when*, "this deponent hath no means of deposing to."

"I hope, sir, that you will not consider the subject of this letter inadmissible to the Register, for certainly it must come under the heads of *art* and *science!* I admire the mechanical contrivance, but never while I have a shirt to my back (and I have but one)—will I consent to save three farthings and a fraction to the great detriment of my laundress, good woman! when my visits to the linen draper must necessarily occur twice in six months instead of once a year.

"I am, &c.

"SOAP-SUDS."

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. V.—*(Continued from page* 110.*)*

M. Chaptal has succeeded in preparing an alum by the direct combination of its constituent parts, on a very large scale; and as the manufactory merits particular notice, we shall here describe it. He constructed a chamber 91 feet long, 48 feet wide, and 31 feet in height to the pitch of the roof. The walls are of common masonry, lined with a coating of common plaister. The floor is a pavement of bricks, set in a mortar, composed of baked and unbaked clay; this pavement is covered by another, in which the bricks overlap the joints of the lower ones, and these are firmly set by a cement, composed of equal parts of pitch, turpentine, and wax, made boiling hot, and poured between the joints instead of mortar. The roof is of wood, put together without a nail: the beams are much closer than usual, and are grooved longitudinally for the reception of the planks that

fill up the space between them. The chamber was then covered on the sides and top with a layer of the cement just mentioned, laid on as hot as possible, so as to penetrate into the pores of the wood and plaister. Three more coats of cement were successively laid on, and to the whole was given an uniformly smooth glossy surface. To prevent the warping of the roof, the exterior was coated also with cement, and afterwards covered with tiles. By the substitution of this cement for lead (the lining usually employed) a vast saving was effected, as it amounted to no more than the lead would have cost at only three farthings per pound.

The clay employed should be of the purest aud whitest kind, such as pipe clay, which is made into a paste with water, and formed into balls about six inches diameter. These being dried in the sun, and afterwards calcined in a furnace, are broken into fragments and spread upon the floor of the chamber. In this state they are exposed to the vapour of sulphuric acid by the burning of a mixture of sulphur and nitre in pots, in the proportion of eight parts of the former to one of the latter. In a few days the calcined clay begins to crack and open, and exhibit an efflorescence, which is the sulphate of alumina (or *alum*). When the efflorescence is completed, it is taken out of the chamber, and exposed to the air under a shed, that the acid may penetrate more intimately; it is next lixiviated and crystallized in the usual manner.

This process has many advantages. It may be carried on wherever a supply of the proper clay may be obtained. The space occupied by the manufactory is much less extensive than by the ordinary modes, and the whole manufacture may be completed in one-third of the usual time. A large quantity of fuel is also saved:—the extraneous salts are fewer, and an important use may be made of the residual sulphate of potash. The alum is so pure as to be little inferior to that of La Tolfa, and is next to that preferred to all others by the dyers, as a mordant for fixing the most delicate tints; the commercial price is much higher than the English alum.

Another very covenient method of fabricating alum, in which no evaporation is necessary, has lately been recommended by M. Caraudau. One hundred parts of clay and five of muriate of soda (common salt), are made into a paste with water, formed into loaves, and calcined in a reverberatory furnace. The material reduced to a powder, is then to be put into a sound cask, and sulphuric acid poured upon it by degrees, in the proportion of one fourth part of its weight, and well stirred at each addition. When the muriatic acid gas has escaped, a quantity of water, equal to that of the sulphuric before employed, is poured into the mixture, and well stirred as before. As the heat abates, more water is poured in at intervals, and stirred up, until eight or ten times as much water as the acid has been added to it. When the liquor has become clear, it is drawn out of the casks (leaving the residuum undisturbed) into leaden vessels, and a further quantity of water equal to that which has been drawn off is poured upon the residuum. When this second liquor has become clear, it is also drawn off into the same cistern, and being therein

mixed with the former, a solution of potash is added, the alkali in which is equal to one-fourth of the weight of the sulphuric acid. Soon after cooling, crystals of alum are obtained from the liquor, equal to three times the weight of the acid used; which may be purified by re-dissolving them in a small quantity of boiling water

This mode of making alum would be found peculiarly advantageous to the manufacturers of Prussian blue, as they might calcine the animal substances at the same time as the clay, with but little additional expense; no addition of potash would be required, and the sulphate of iron contained in the mother water would be very serviceable. The sulphate of potash resulting from the washing of the Prussian blue might be very profitably employed in the making of alum for sale; in which case, a larger quantity would of course be requisite than if the alkali alone were used. The distillers of aquafortis might likewise employ their residuums to the same purposes, which contain the alumina and potash requisite; and as the latter exists in too great a proportion, one-eighth of calcined clay might be added to the residuum, reduced to powder; which should be sprinkled with sulphuric acid, and be afterwards lixiviated and crystallized in the usual manner. The mother water of this alum would also be serviceable in the making of Prussian blue:—so that the fabrication of alum, Prussian blue, and aqua-fortis, might be advantageously combined in one manufactory.

Alums are likewise made by the employment of the alkalies ammonia and soda, as well as potash; but they are not usually met with in commerce, probably on account of the processes being generally less economical:—their properties are much the same as those made with potash.

The Roman alum, manufactured at La Tolfa, is the purest and dearest of all; it is in pieces about the size of a walnut, shewing more or less of its crystalline form, and is opaque on account of a farinaceous efflorescence with which it is covered. The Levant or Roche alum appears in fragments, nearly the same size as the former, but in which the crystalline form is more obscure; it has a dirty rose-coloured tint. It was anciently made at Roccha, now called Edessa, in Syria, whence its commercial name; Smyrna is the place from whence it is shipped. The French alum (that is Chaptal's, the manufacture of which we have described), is in small clear colourless crystals. The English is in large irregular masses, considerably larger than the other. The Roman alum, as well as the French, is superior to the English, when employed as a mordant for delicate colours; but for other colours, and for the various uses to which alum is usually employed, each kind may be used indifferently. A given weight of the English will go farther than any of the rest, from its possessing a less quantity of the water of crystallization.

The most injurious contamination of alum is the sulphate of iron; to get rid of which, M. Thenard recommends its being dissolved in boiling water, and agitating the solution with rods as it cools, which reduces the salt to a granular powder; being afterwards washed two or three times with cold water and drained, it is reduced to a perfectly pure state.

When alum in powder is mixed with flour or sugar, in the proportion of three parts of the former to one of either of the latter, and calcined, they form the pyrophorus of Homberg. They should be melted in an iron ladle, till the mixture ceases to swell, be then pounded and put into a glass phial; which should next be heated in a sand bath until a blue flame ceases to issue from the neck of the vessel; it should then be allowed to cool, and afterwards corked up for use. This substance possesses the remarkable property of taking fire when exposed to the air.

Alum is very extensively employed in many manufactories. To the dyer it is invaluable, and perhaps indispensable. It not only gives a brilliancy and delicacy of tint to a variety of colours, but it is particularly serviceable in clearing and opening the pores of substances to be dyed, thus adapting them to the reception of the colouring particles, and at the same time fixing the colours. In water-colour painting it is employed also in giving a brilliancy and durability to the tints. Crayons usually consist of the earth of alum, combined with the various colouring matter. Alum added to tallow renders it harder. It is used on printer's cushions, and in calico printing. It is employed in the curing of fish. It is extensively used in tanning, especially in the preparation of white leather, and in many other manufacturing processes. Wood saturated with a solution of alum is difficult of combustion; the same effect is produced upon paper similarly treated, which, by its exclusion of moisture, also peculiarly adapts it to the keeping of gunpowder. Alum, added to turbid water, in the proportion of from five to ten grains to the gallon, renders it perfectly limpid in a few minutes, without communicating any bad taste or quality. A small quantity of alum added to milk helps the separation of its butter. In medicine it is extensively employed as an astringent.

(To be continued.)

LETTERS OF ENQUIRY.

From "W. W. S.—"

The writer "aware that the utility and consequent security to be derived" from a *conductor of lightning*, "depends entirely *upon* its construction, any error in which may seriously endanger a building instead of protecting it; and that it requires a considerable degree of scientific knowledge to erect a conductor *upon safe and philosophical principles*" would be much obliged by the information through the medium of the Register, who are the persons, and of what profession they are to whom such a task can with safety be entrusted.

From "W. L."

"Suppose a pinion wheel whose diameter is 5 inches has ten teeth, which has to work in a wheel whose diameter is 48 inches;—Query, how many teeth should there be in the 48 inch wheel so as to have the least quantity of friction, and what is the rule by which the number of teeth is determined?"

FISHING THROUGH THE ICE.—At Hudson's Bay, in rivers near the sea, and in lakes of a greater depth than 10 or 12 feet, fishes are caught all the winter, by cutting holes through the ice down to the water, and putting lines and hooks in them. But in taking them with nets, they cut several holes in a straight line the length of the net, and pass the net with a stick fastened to the head line, from hole to hole, till it reaches the utmost extent; and what fishes come to these holes for air, are entangled in the net; and these fish, as soon as they are brought into the open air, are instantly frozen as stiff as stock-fish.

GUNNERY.—Some experiments were made a few days since at Woolwich upon Lieutenant Cook's plan for lessening or preventing the recoil of guns, which were attended with satisfactory results.

RECENT PATENTS.

MASTING VESSELS.—To Mr. T. R. Guppy, of Bristol, for certain improvements therein—Dated November 4th, 1824.

PROPELLING SHIPS, &c.—To William Busk, Esq. of Broad-street, for certain improvements therein.—Dated November 6, 1824.

AUGERS AND BORING BITS.—To W. Church, Esq. of Birmingham, for certain improvements therein.—Dated November 4th, 1824.

STEAM ENGINES.—To John Moore, Esq. of Bristol, for additions to, or improvements therein—Dated November 6th, 1824.

ADVERTISING MACHINE.—To Mr. G. S. Harris, of Knightsbridge, for a machine for the purpose of giving the most effectual and extensive publicity by day and by night to all proclamations, notices, legal advertisements, and other purposes to which the same may be applicable, destined for universal information, and which will henceforward render unnecessary the defacement of walls and houses in the metropolis, and its vicinities, by bill sticking, placarding, and chalking, which latter practices have become a great and offensive public nuisance.—Sealed October 21st, 1824. Two months.

TO OUR READERS AND CORRESPONDENTS.

W. L.'s very interesting Communication came too late for insertion in the present number.

W. W. S. is informed that we do not know any person in the line mentioned in whom we should have sufficient confidence to recommend.

THOMAS H——N is advised to make his application to Arthur Aiken, Esq. Society of Arts, Adelphi.

R. T.'s drawing does not accord with the written description;—if he will have the goodness to call at our publisher's the matter may be explained.

SATHMO's proposition is under consideration.

H. L.'s Communication will, if possible, be inserted in our next.

Communications received from "M. H."—"A Bullet."—"James P."—"Vapour."—and "H. H."

J. G.'s excellent fire escape, &c. will appear in our next,—the subject is being engraved.

[*To be continued every* FORTNIGHT.]

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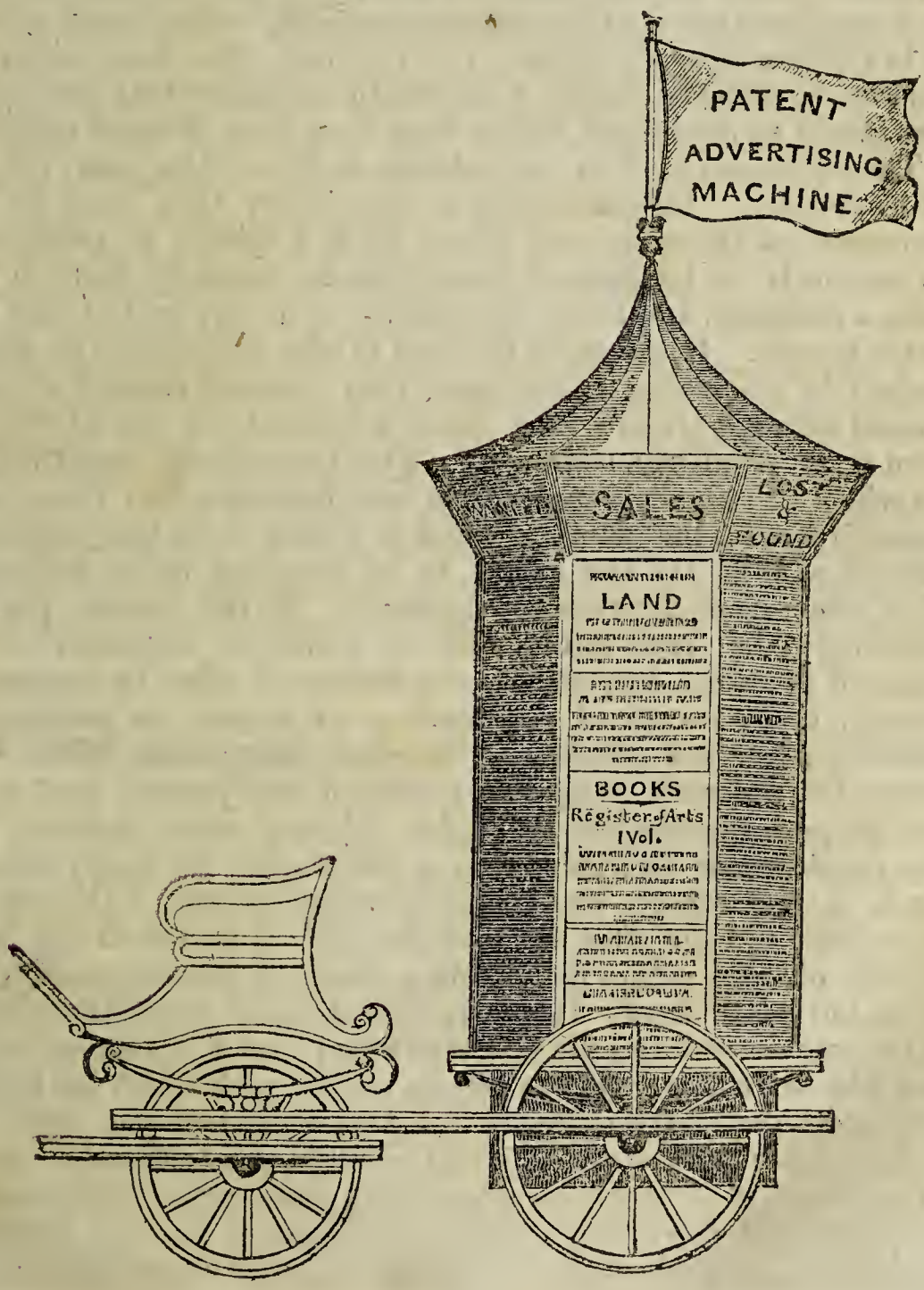
REGISTER

OF

THE ARTS AND SCIENCES.

No. 33.] SATURDAY, DECEMBER 25, 1824. [Price 3*d*.

CONTENTS.—Patent Advertising Machine, 130,—Mackintosh's Patent Composition, 131,—Preparation of Caoutchouc, 132,—Artificial Pearls, *ib*,—Encyclopædia of Useful Arts, 133,—Curious Work of Art, 135,—Gregory's Patent Ladders, 136,—Mexican Mines, 139,—Tabasheer, 140,—Perpetual Snow, 141,—Freezing of Provisions, *ib*,—Marine Plants, 142,—Fresh-water Plants, *ib*,—Antediluvian Bones, *ib*,—Discovery of Galvanism, 143,—Sea Worms, *ib*,—Patents, Premiums, and Correspondents, 144.



PATENT ADVERTISING MACHINE.

THERE is a great deal of merit and originality in this contrivance; It seems to belong to that class of inventions the success of which appears so self-evident, that every body wonders how it was that *he* never thought of it before; and this conveys an indirect, but a very pleasing compliment to a man's ingenuity.

The nuisance arising from the exertions of those "paste gems," the very Worshipful Company of Bill-stickers, is at present most intolerable. If their aspiring exertions in the public cause were confined to the precincts of dead walls, and blind alleys, we could have found in our hearts to award to them that degree of applause, to which all popular characters are more or less entitled: but the peculiar predilection which these gentlemen evince for the adornment of public edifices and private dwellings, and the invincible repugnance they entertain for those salutary cautions, which though staring one in the face at every corner of every street, they have never yet been able to discern, render it at length necessary that some measures should be adopted to relieve them from their elevated duties.

The arguments held by the patentee in favor of his plan, are fair and reasonable. Independently of the injury thus done by the defacement of the walls and alleys, such a system of public advertisement is in its general consequences decidedly bad; to the public a nuisance, and to the advertisers, of a very partial and uncertain benefit. If a man be desirous to give publicity to an advertisement by placarding it, it is more than probable that out of every hundred bills not ten are in a situation to meet the eyes of those to whom it is peculiarly addressed. The innumerable quantities of bills which are usually mingled into one heterogeneous mass must necessarily defeat the notoriety which is sought to be thus obtained, inasmuch as that the eye ceases to be attracted to an individual object where many are crowded together. By the present plan of placarding walls, each bill is made to jostle its neighbour, or to deprive it of its fair proportions,—to destroy its effect by greater effrontery, or by excess of magnitude,— or to put its modesty to shame by glare and glitter; it therefore must needs follow that nothing but the most delightful confusion can prevail, and every other purpose effected but the right. If after much difficulty and very considerable discrimination, a bill-sticker be happy enough to gain a snug corner, and accomplishes his designs, a thousand to one but half an hour after the unlucky bill is buried in the most profound oblivion within the winding sheet of another equally aspiring, but less ill-fated. It is therefore nothing that the bill is posted: the bill-sticker performs his task faithfully; and it is amusing to see (and who has not seen it) the solemn gravity with which his hawk's eye surveys the square contents of a dead wall, and the tactics he displays (after a due synopsis with the bill in one hand and his brush in the other), in pouncing on a promising spot; and not less amusing is the glance of the stranger over the variegated table of contents before him; he reads that "a reward of £50 is offered for the

apprehension of" " a Leasehold Estate in" " Pidding's lucky corner, where £40,000 may be gained at the trifling risk of" " the Peristrephic Panorama with four views of" " Kent's Directory for the year 1825, containing," " the Fire in Fleet Street," " and a valuable collection of modern plate."

It is to obviate all this that the " Patent Advertiser," is to perambulate our streets. The form of the machine is, as will be seen by the wood cut, octagonal, and is placed upon a coach frame, in such manner that it may perform a slow rotatory motion, for the purpose of presenting its sides consecutively for the benefit of passengers. The means by which the motion will be produced is of course purely mechanical, and may be effected in various ways; either by the ball and socket, or by an endless screw upon the axle, acting upon a central shaft in the body of the machine, or by a pivot, or any other contrivance; the simplest of course the best.

The driver will give notice of its approach by the auxiliary of a bell, or of a speaking trumpet, or of a watchman's rattle, or by the stentorian exercise of such a pair of lungs as he may be endowed withal, whichever of these means may seem most meet to produce the greatest number of aerial pulses. Each compartment will be appropriated to a distinct branch of business, and be arranged and entitled accordingly, such as sales, losses, rewards, and so forth. The carriage will contain copies of the advertisements, which may be obtained for the cost of a ha'penny or some such trifle, in order to check impertinent trouble or idle curiosity. Persons wishing to avail themselves of this desirable and effectual mode of advertising will be charged so much per foot space, occupied by the bills, and according to the time they may think it necessary to continue it.

These are the short heads of the plan which it is proposed by the Patentee to adopt; and we heartily wish him success in an undertaking which promises to be eminently useful and advantageous, and to abate an evil so long experienced from the effects of Bill-sticking.

MR. MACKINTOSH'S PATENT COMPOSITION FOR RENDERING CLOTH, &c. WATER-PROOF.

So extensively is Caoutchouc or Indian rubber being now brought into use, that we have very recently had occasion to register four or five new patents in which this singular resinous substance forms the basis. To these we have now to add the patent process employed by Mr. Charles Mackintosh, for rendering fabrics of hemp, flax, cotton, wool, silk, and various other matters, impervious to water; by the employment of a thick elastic varnish made by dissolving Caoutchouc in a small quantity of coal oil. The proportion of coal oil required to dissolve a given quantity of caoutchouc will vary according to its peculiar quality, as well as that of the resin, but the average quantity required will be about a quarter of a pint of the oil to a pound of the resin. To facilitate the solution, the caoutchouc is to be cut into as thin shreds as possible, and the heat of a steam bath applied

by immersing the vessel in it. When the solution is completed it is to be strained from the residuum.

To apply this varnish, the cloth is to be stretched upon frames and brushed over with it, and the varnished surfaces of two pieces of cloth, whilst in a sticky yet tolerably hard state, are laid one upon the other, and passed between rollers which firmly and inseparably unite them. A flexible and thoroughly water-proof material is thus obtained for a variety of useful purposes, without the inconvenient and unpleasant varnished sticky surface so common in water-proof coverings.

Artificial Pearls.—This elegant manufacture is of French origin, and is still carried on by that ingenious people in a superior manner. They are formed of thin glass bubbles, with their interior surfaces covered with a pearl-coloured substance, which is thrown into them through a small tube. The substances employed for this purpose are the silvery scales of fishes, particularly those of the bleak; they are prepared by being well beaten in water; the silvery sediment next undergoes several ablutions, and is then mixed with transparent agglutinating matter, and in this state is employed for coating the bulbs. The inventor was a bead-maker of the name of Jacquin, who lived about the time of Henry the Fourth. This man observed, that on washing the scales of the bleak fish, a very beautiful silver-coloured powder was obtained, and it occurred to him that by introducing this substance into the interior of finely blown glass beads, slightly tinged with opaline hues, a perfect imitation of real pearls might be made. Jacquin experienced considerable difficulty in preserving this silvery powder, which if not speedily made use of, quickly became putrid, diffusing an intolerable smell. Attempts were made to preserve it in spirits, but this was found to have the effect of destroying its beautiful lustre. It was at length discovered that the volatile alkali possessed the power of preserving the substance without detriment to its lustre.

Preparation of Caoutchouc.—Mr. T. Hancock has succeeded in working Caoutchouc with great facility and readiness. It is cast into large cakes, and being cut with a wet knife into thin sheets of 1-8th or 1-10th of an inch in thickness, can then be applied to almost any of the purposes for which it is usually employed. The Caoutchouc thus prepared is more flexible and adhesive than that which is found in the shops, and is worked with singular facility. Recent sections made with a sharp knife or scissors, when brought together and pressed, adhere so firmly as to resist rupture as strongly as any other part; so that if two sheets be laid together, and cut round, the mere act of cutting joins the edges, to which if a little pressure be given, a perfect bag is made, as it were, of one piece of substance. To prevent the adhesion of those parts which are not intended to be connected, a little flour is rubbed over them.

In this way flexible tube catheters are made. Tubes intended for experiments in gases are made double with a piece of twine wound spirally round between the two, which is imbedded in the caoutchouc; by these means the tube will bear a great degree of pressure laterally without expanding in that direction, while at the same time it will admit of a great extension lengthwise. Bags made as before described are so exceedingly elastic, and perfect in their junctions, as to admit of being expanded into balloons with considerable ascending power.

Leather has also been coated with a thin surface of Caoutchouc, rendering it perfectly water-tight. Collars or washers for stop-cocks, made of this substance answer extremely well, as very little compression is required to render them tight; and its application to many other useful purposes are too obvious to be enumerated.

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. VI.—*(Continued from page 127.)*

We shall conclude the article on alum, by giving to our fair readers the most-approved process for making those elegant crystallized ornaments, at present so much in fashion. Dissolve eighteen ounces of alum in one quart of water by heat, frequently stirring it. The solution being complete, take the vessel from the fire; and when the temperature of the liquid is reduced to about blood-heat, the subjects that are to be covered with the crystals are to be suspended in it by a thread; or, another vessel, (a broad glazed pan answers well) may be ready prepared with the subjects suspended by threads to a stick laid across the pan, into which the liquid may be poured. In twenty-four hours the articles, which will be found covered with a beautiful crystallization, are to be taken out and dried in a cool place. To secure the adhesion of the crystals to articles having smooth or polished surfaces, some cotton is wound round them previous to their immersion, the fibres of which become imbedded among the crystals. Any required tint may be given to the crystals by employing any of the vegetable or mineral colours used in dyeing. A fine *red* is given by a solution of Brazil wood; the colour and form of the crystals of which have so near a resemblance to natural rubies that they might be mistaken for them, were they equally hard; and it is worthy of remark that the constituents of the real oriental ruby are very nearly the same. A *purple* colour may be produced by adding a little of logwood;—a *yellow*, by French berries;—a *blue*, by indigo;—a *green* by verdigris, &c.

An ingenious writer, in the Monthly Magazine for October, 1824, recommends as a convenient means of preserving many subjects in natural history, the coating of them thinly with crystallized alum; by which many specimens both of the vegetable and animal kingdoms may be retained in their natural forms and colours.

AMALGAM, is a metaphorical term, derived from the Greek, invented by the ancient chemists, and retained by the modern, to

signify any metallic alloy, of which mercury forms one of the constituent parts.—see ALLOY. In all other mixtures of metals in which mercury does *not* form a component part, the term *alloy* is given to them. The amalgams of gold, silver, tin, lead, zinc, bismuth, and copper, with quicksilver, are all white. All metals except iron and copper spontaneously unite with mercury; the latter with difficulty, but the former not at all. Heat assists materially in amalgamation, but it is not requisite with all the metals; the mere rubbing of them together in a mortar, previously reduced to thin plates or grains, being generally sufficient to perfect the operation. Thus gold in leaves may be amalgamated in a few minutes, but if time be given the effect takes place without trituration; by simple immersion in mercury for two or three days, thick masses of gold will be penetrated, as will also silver and tin, the affinity of mercury to these metals being likewise very powerful. As we shall have occasion to treat of the various combinations of the several metals under their separate heads, *(which see)* we shall here confine our observations by giving a necessary precaution to be observed in amalgamating by means of heat. Dangerous explosions are apt to take place when it is attempted to combine the mercury in a cold state with metals that are in a hot fluid state; to prevent which it is expedient to heat the mercury to the boiling point, and pour it into the fused metal just previous to its becoming solid.

AMBER is one of the most beautiful substances in nature. Its hardness, together with its brilliancy and transparency, caused it formerly to be ranked among the precious stones. An ancient naturalist named Philemon, quoted by Pliny, considered it to be a mineral juice extracted by the sea, and dried and hardened by the sun on the sea shore. Pliny, was however of opinion, that it was nothing but the resin of a tree hardened by the cold, which appears to be now established by the investigations of the learned Dr. Brewster, of Edinburgh; from whose experiments it is evident that it is formed by nature, in the same manner as gum-arabic and other gums, by the successive deposition and induration of vegetable juices. Amber is often found to contain insects in a good state of preservation, which proves that it has been in a liquid state, during which time it enclosed these bodies. It is found in various countries, on the surface as well as under ground; but most plentifully on the Prussian shores of the Baltic sea. Its specific gravity is about 1.08. Wallerius reckons several varieties of amber, viz. the white, pale yellow, citron yellow, golden yellow, and dark red, which five are transparent; and five more which are opaque, viz. white, yellow, brown, green or blue, and veined amber. These varieties may, however, be extended to a more considerable number. As great prices are sometimes put upon pieces of amber on account of their size, or to their containing insects in a fine state of preservation, it is necessary to mention that many persons know how to colour or render amber transparent at pleasure; as well as to soften it to such a degree as to enable them to introduce extraneous bodies within it. It is said that amber boiled in rape seed oil for twenty hours renders it both hard and transparent. Wallerius, however, informs us that gold-coloured amber always owes its tran-

sparency to nature, and that amber rendered transparent by art is always of a pale colour. The former being the most valuable is preferred for cutting into necklaces, bracelets, snuff-boxes, and various ornamental articles. Amber burns with a yellow-coloured flame, emitting a thick smoke of an agreeable odour, leaving a very small earthy residuum; from which M. Bourdelin subsequently extracted iron by means of the magnet. The largest piece of amber ever found weighs thirteen pounds, and is preserved in the cabinet of Berlin; five thousand dollars were offered for it, but refused. Amber has been in high esteem as a medicine for more than two thousand years. Plato, Aristotle, and other writers, highly commended its virtues. It has been extensively administered in a variety of forms almost ever since, but at present its employment as a medicine is very limited.

Amber is insoluble in water and alcohol; none of the essential or expressed oils will dissolve it without previous decomposition and long digestion. None of the acids will dissolve it, except sulphuric acid, when the solution acquires a reddish purple colour; the addition of water separates the amber from the acid.

The essential oil of amber is obtained by distillation. The oil which rises at first colourless, becomes brown, thick, and empyreumatic as the heat increases, which may be rectified by subsequent distillations. By Rouelle's process the oil is obtained pure and colourless by a single operation. He directs that it be distilled in a glass alembic with water, at a heat not exceeding 212° Fahrenheit. The action of light upon the colourless oil renders it brown, for which reason it should be kept excluded therefrom in stone bottles.

Amber becomes electric by friction; the ancients in consequence gave it the name of *electrum*,—hence the origin of the term *electricity*.

To make amber varnish, one pound of amber is put into a covered iron pot and heated over a gentle fire till it becomes soft and melted into one mass. The vessel is then taken off the fire, and suffered to cool a little, when two pounds of the common painter's varnish of good quality, are added to it and the mixture again put on the fire, where it is stirred until it boils up; and then again removed. Having cooled a little, two pounds of oil of turpentine is to be added to it by degrees. Should the varnish be found too thick on cooling it may be thinned by the addition of more oil of turpentine. A brown colour is communicated to this varnish by the burning of the amber in the first part of the process; if it be required very bright, the amber should be first reduced to powder and dissolved in the best painter's varnish, over a very gentle fire, in a Papin's digester.

(To be continued.)

Curious Work of Art.—A young man of the name of Patterson, a blacksmith at Doune, produced to us a few days ago, the blade of a pen-knife, in the centre of which he said would be found a portion of straw entire, and without having suffered in the smallest degree from fire. The blade, which was well tempered, and without the least flaw, was accordingly broken in the presence of several

respectable individuals when a piece of straw as described, was found enclosed, although the metal had repeatedly to be heated before it was properly tempered.—*Stirling Journal.*

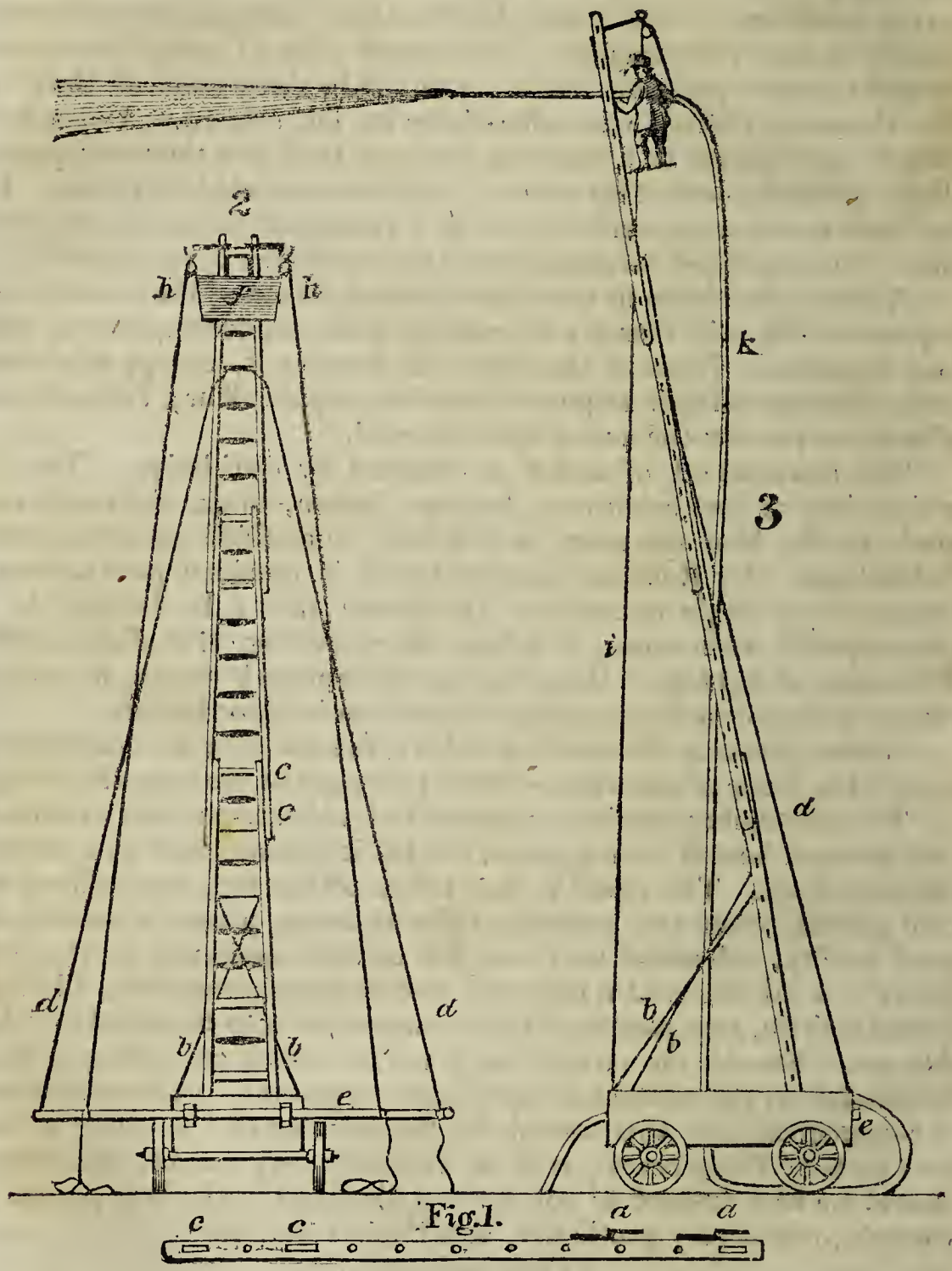


Fig. 1.

GREGORY'S PATENT LADDERS AND FIRE ESCAPE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"HAVING noticed some very judicious and valuable hints respecting the dry-rot in timber, in a recent number of the Register, communicated by my neighbour, Mr. J. Gregory, it has occurred to me, that among the many mechanical inventions of that ingenious person,

there is one in particular which ought to have a place in your interesting publication, from its ready applicability to a variety of useful purposes. I do not remember to have seen an account of it in any of the scientific journals, notwithstanding it was the subject of a patent three or four years ago.

The invention consists in an improved Ladder, any number of which may be rapidly and firmly connected together so as to form a series of ladders, to a great extent, peculiarly effective when applied to a variety of purposes, as I shall have occasion to mention. My object in the present communication is however only to shew, their application as a fire-escape, and as an auxiliary to a fire-extinguishing engine.

"*Fig.* 1. exhibits an edge view of one of a series or set of these Ladders in its simplest form; the length is about eight or nine feet. *Fig.* 2. exhibits a front view of three of these Ladders connected together, and applied as a fire-escape; *Fig.* 3. exhibits an edge view of the same, but comprising four Ladders, so connected, and employed in directing the play of the engine immediately into that part of the house on fire, inaccessible without such assistance.

"The Ladders are all of one size and make; so that any one of them that may be taken up, accurately fits that Ladder to which it is applied, avoiding thereby all confusion and difficulty in their ready employment.

"The means by which they are united is exceedingly simple, and effective;—two long hooks or half-staples, *a a*, are fixed on the back of each Ladder by means of an iron strap, and rivetted through.

"A set of such Ladders Mr. Gregory proposes should accompany each engine, together with the escape-case, and the tackle apparatus as shewn in the engraving; all of which will easily lie flat on the upper floor of the engine, and occupy no useful room. On arriving at the scene of conflagration, and it is determined to rescue some persons from impending danger by means of the escape, the lower Ladder is first raised, or lifted up into the position shewn, the feet of which are secured in their place by means of a bolt passing through them, and two blocks fixed upon the engine for that purpose; the two iron supports or stays, *b, b*, are then raised (which are likewise connected to the floor of the engine by a simple joint), and crossing each other their upper ends are hooked into staples fixed in the back of the Ladders. The lower Ladder thus firmly fixed in the space of half a minute, a man mounts it, and dropping another Ladder on the top of it, it is immediately fast and solid; each Ladder being provided with two flat steps, *c, c*, at their lower end, of uniform dimensions, as well as two flat half staple at their upper ends, which fit accurately into each other. Two Ladders thus raised, a third, a fourth, or a fifth are added in like manner, requiring no other support; but as a further security, when the height is considerable, two guy ropes, *d, d*, are employed to preserve the Ladders in their proper line of position. For this purpose, the back of the engine is provided with two large square staples, through which the bar, *e*, is thrust, and the guys being tied to the upper Ladder are made fast to

the ends of the bar, as shewn. The engine thus equipped may be wheeled about, and the Ladders capable of any required extension, be presented to any window. For women, children, and timid persons, the escape car, *f*, is quickly put into operation;—two irons furnished with hooks (or it may be of one piece), are placed on the top of the uppermost Ladder, to which they are adapted, and to each of these is hung a block; a rope passes through each of the blocks, with one pair of the ends, *h*, *h*, fastened to the sides of the car; and the other ends are employed by the persons below in pulling up or letting down the car, with the utmost expedition, and with perfect security to the rescued persons. The car is very light, yet strong, and made so as to fold up flat.

"The letters of reference in either of the figures refer to the same parts; *Fig.* 3 represents, as before-mentioned, a series of four Ladders united. This may be supposed to be standing self-supported in the middle of a street. Upon the top of the uppermost Ladder a block is hung, supported by a jib iron; a rope, *i*, passed through this block, descends to the ground; the hose, *k*, of the engine is then made fast to it, and is hauled up by the men below, while a fireman ascends the Ladder, and presents the branch of the engine to the precise spot required, with an effect tenfold to what could be done below; and would, no doubt, be frequently the means of arresting the progress of the flames, which would otherwise destroy the whole building; notwithstanding the utmost exertion of the engines, without such assistance.

"From the lightness and portability of these Ladders when separated, and the facility of connecting them, they may be employed effectively in very confined situations; in which cases, the first is pushed upwards against the wall, and the next put on underneath; this is shoved up, another and another added in like manner. Thus, in the case of fire, they may be carried through narrow passages and erected at the backs of houses, and the engines may in consequence be brought to play upon parts otherwise inaccessible. In this manner, too, the Ladders are likewise very serviceable in painting, white-washing, and repairing high narrow places, and supersede in these cases the necessity of scaffolding.

"Fearful of being too prolix, I shall not enter into an estimate of the advantages of Mr. Gregory's apparatus, compared to other inventions of the kind; and I am fully persuaded that it would be quite unnecessary, as the superiority of Mr. Gregory's is quite manifest, whether employed as a fire-escape or as a fire-subdueing apparatus.

"By a remarkable and very curious application of the line and pulley Mr. Gregory has constructed a variety of ladder machines, which, by the turning of a winch, shoot up like rockets a series of Ladders; the advantages they confer to the architect, builder, and a variety of the mechanical professions, have been well attested by numerous engineers and artificers, in particular those of the Board of Works; besides being patronized by many of our most enlightened noblemen, who employ them for the several purposes for which they are designed.

"From the frequent conversations I have held with Mr. Gregory relative to his Ladders, and the opportunities I have had of witnessing experiments with the Ladder Machines in front of his house, I have made the preceding statements, in perfect confidence of their correctness.

"The Ladders are applicable to a number of general purposes; within, to libraries, picture-galleries, rooms, &c.; without, to roofs, windows, &c. Nor are they less useful in farm-yards, orchards, pleasure-grounds, or woods; as, by having no other support than their own foundation, being capable of any extension, and moving any where with a person on their summit, they afford a safe, easy, and rapid means of lopping, pruning, gathering, &c. without the slightest injury to the trees.

"Mr. Gregory's Ladders were employed in Westminster Hall on the occasion of the Coronation of his present Majesty, and the following are the terms in which they were consequently noticed in the *St. James's Chronicle*:—"The promptness and facility with which the iron brackets for the suspension of the chandeliers, and their long and ponderous gilt chains, were adapted and attached to the lofty roof (a task which with ordinary scaffolding would have consumed months), is altogether due to Mr. Gregory's patent Scaffolding, a new application of the principle of his Fire-ladder. By these instruments, which were, by the exertion of two men only, raised to the necessary elevation of 45 feet in a quarter of a minute, the brackets were fitted as fast as they could be prepared. The guests in the Hal had an opportunity of witnessing the surprizing velocity of the sma llFire-ladders of the same ingenious artizan. The Hall, which on the coronation of George the Third occupied 4½ hours to light, though a great number of persons were then employed, was on Thursday completely lighted up in 25 minutes, by Mr. Gregory and his son, by the use of two of these Ladders."

"*Judd-street, 9th December*, 1824. "H. L."

THE MEXICAN MINES.

(Continued from page 111.*)*

Not only the mines already mentioned, but many others in the districts of Guanaxuato and Potosi, have yielded immense fortunes to their several proprietors. The Count of Valenciana, who was an obscure, but enterprising individual, without capital, acquired rapidly such vast treasures that the court found it necessary to make a *Count* of him. A Frenchman of the name of Laborde met with such success, that he built a church for the inhabitants of the place at the expense of £80,000, and ornamented it with a sun of gold of the value of £20,000. This individual afterwards met with a reverse of fortune, when the Archbishop honourably returned to him his sun of gold; with the produce of which he recommenced mining, and acquired another immense fortune. The Count de Regla derived such wealth from his mining pursuits, that he not only presented the Court of

Madrid with two ships of war, one of them of 120 guns, but lent them also five millions of piastres, which sum it is probable the Count has placed among his list of bad debts.

It is very gratifying to learn that the labour in these Mines is perfectly free; and that no species of labour is better paid for. A miner earns from five to five and a half dollars a week, while the common labourer of the country receives not more than a dollar and a half. No slaves, criminals, or forced labourers, are ever employed in the Mexican Mines.

More than three fourths of the silver obtained from America is extracted from the ore by means of quicksilver. The loss of quicksilver in this operation is immense. The quantity consumed in New Spain alone is about 16,000 quintals per annum. In the whole of America about 25,000 quintals are annually expended, the rest of which is estimated by M. Humboldt at 6,200,000 livres.

If the uneconomical method of amalgamation practised by the Mexican Mines surprized M. Humboldt, their clumsy, imperfect and expensive mode of clearing the mines from water seemingly surprized him still more; in consequence of which the richest mines have been overflowed and abandoned. The disturbed state of the country owing to the recent revolution has caused a cessation of the working of several other valuable mines, and they are now for the most part filled with water. To restore them to their productiveness British skill, industry and machinery are now about to be introduced, and an association has been formed for that purpose, with a subscribed capital of one million sterling.

After concluding the account of the Mines of New Spain, M. Humboldt gives a general view of the riches of the other provinces of America. In Peru, silver ore exists in as great abundance as in Mexico, but the arts of mining, and the methods of separating the silver from its ore, are still more defective in Peru than they are in New Spain. In Buenos Ayres the principal mines are at Potosi. Chili furnishes a small quantity of silver and a large portion of gold. New Granada and Brazil afford gold only.

The total amount of gold and silver annually furnished by America is about nine and a half millions sterling.

TABASHEER.

We have received a Letter from "a Subscriber" requesting some account in the Register of an extraordinary substance called Tabasheer, which a few years since excited the attention of the scientific world. We confess that our knowledge of the matter is extremely limited, but such information as we possess we are happy to lay before our readers.

Tabasheer is an earthy substance (of the nature of silica) found in the hollow stem of the bamboo. Its extraordinary optical properties were described by Dr. Brewster, in the Philosophical Transactions for 1819. There are two kinds of Tabasheer, the transparent and

the opaque. The specific gravity of the former is 2,402, and the latter, 2,050. The transparent has the extraordinary property of becoming white and opaque by the absorption of a small quantity of water, and perfectly transparent by an increased quantity. As this effect takes place indiscriminately with all fluids the effect cannot be sought in any chemical action, but must be owing to the changes which the light undergoes in traversing the vacuities of this porous substance. The essential oils, (with the exception of oil of cassia), are quickly absorbed, and as quickly evaporated. The fat oils are slowly drawn in and remain a long time in its pores; in all these cases an opacity is produced. Any required colour may be communicated to Tabasheer, by tinging the fluid to be imbibed. The opaque Tabasheer however acquires a beautiful transparency when its pores are filled with the oil of beech nut. Thus an opaque substance in appearance like chalk is converted into a transparent mass which the light penetrates in every direction. In both kinds of Tabasheer, the quantity of water absorbed exceeds in weight that of the Tabasheer.

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

The Snow on the Cordilleras des Andes.—"There is in all this range of mountains, as far as I have travelled," says M. Bougier, a certain boundary, beyond which the snow never melts; this boundary, in the midst of the torrid zone, I found to be 2,434 fathoms above the level of the South Sea. The snow indeed falls much lower, but then it is liable to be melted the very same day; whereas above that it never melts, but serves to encrease

"The gather'd winter of a thousand years."

Speaking of this stupendous ridge of mountains, Dr. Robertson says, "The Andes may literally be said to hide their heads in the clouds; the storms often roll, and the thunder bursts beneath their summits, which, though exposed to the rays of the sun in the centre of the torrid zone, are covered with everlasting snows." The most elevated of them is Chimborazzo, which is 20,280 feet;—no less than 7102 feet above the highest mountain in the ancient Continent. The line of congelation on Chimborazzo, or that part of the mountain which is covered with snow perpetually, is no less than 2400 feet from its summit.

Preservation of Provisions at Hudson's Bay.—The seamen freshen their salt provisions by cutting a large hole through the ice in the stream or tide of the river, which they do at the beginning of the winter, and keep it open all that season. In this hole they put their salt meat, and the minute it is immersed under water, it becomes pliable and soft, though before it was hard frozen. Beef, pork, mutton, and venison, that have been killed at the beginning of the winter, are preserved by the frost for six or seven months; geese, partridges, and other fowl are thus preserved in the same state as they are killed.

Marine Plants.—The plants that grow at the bottom of the sea are found under all climates, because the vicissitudes of heat and cold are never felt at the bottom, the temperature at certain depths being every where the same. Climate influences only such as prefer growing in shallow water. A very common sea-plant (fucus natans) generally known by the name of sea tang or sea grass is universal from the equator to the poles. As there are an immense number of marine plants, a great many of them are to be found every where, some however seem to require a more concentrated saltness of the water, while others flourish most on a moveable bottom. It has been remarked generally that the heights and hills under the surface of the ocean produce a greater abundance of plants, than the deep valleys.

Fresh-water Plants.—It has been commonly observed by naturalists, that the plants of fresh water are more widely dispersed than those of the land. Many of the aquatic plants of the north of Europe, grow also within the torrid zone. The common duck-meat (Lemna Minor) grows all over Europe, Asia and North America; from Pennsylvania to Japan, whether eastward or westward. The common bulrush (Typha latifolia) is every where met with over the same space, including also, the West India Islands. The causes of the wider dispersion of aquatic plants, than those of land is considered to be owing to the water-fowl, which by a wonderful instinct annually migrate from a colder to a warmer climate, and as most of those plants perfect their seeds at the time the birds are preparing for their journies, it is considered that they carry the seeds with them, some of them sticking to their feathers, and others which they swallow being afterwards voided without injury.

Antediluvian Bones.—Some miners recently engaged in sinking a shaft in search of calamine, near the western extremity of the Mendip hills, intersected a steep and narrow fissure, which, after descending 80 feet, opened into a spacious cavern 150 feet long, and about 30 feet wide, and from 20 to 30 feet high. In proceeding to open a horizontal passage to this cavern from the side of the hill, the workmen suddenly penetrated into another cavern of inferior dimensions to the former, the floor of which was found covered with a bed of sand, mud, and fragments of limestone, through which were interspersed an enormous quantity of bones, horns, and teeth. The thickness of this mass has been ascertained, by a shaft sunk into it, to be in one place nearly 40 feet. The bones belong chiefly to the ox and deer tribes; among which are several varieties of the elk, wolf, and bear. From the fact of some of them belonging to the great extinct species of bear, Professor Buckland observes, "it is clear that they are of antediluvian origin." In the roof of the cave there is a large chimney-like opening, which appears to have communicated formerly with the surface, but which is choked up with fragments of limestone, interspersed with mud and sand, and adhering together imperfectly by a stategmetic incrustation; through this aperture it is probable the animals fell into the cave, and perished in the period preceding the inundation, by which it was filled up; the immense quantity of the bones shews the number of individuals that

were lost in this natural pitfall to have been very great. In this manner cattle are now continually lost by falling into similar apertures in the limestone hills in Derbyshire.

Discovery of Galvanism.—The discovery of the effects of electricity on animals took place at the time from something like an accident. The wife of Galvani, at that time professor of Anatomy in the University of Bologna, being in a declining state of health, employed as a restorative, according to the custom of the country, a soup made of Frogs. A number of these animals ready skinned for the purpose of cooking, were lying, with that comfortable negligence common to both French and Italians, which allows them without repugnance to do every thing in every place that is at the moment most convenient, in the professor's laboratory, near an electrical machine, it being probably the intention of the lady to cook them there. While the machine was in action, an attendant happened to touch with the point of the scalpel the crural nerve of one of the frogs, that was not far from the prime conductor, when the limbs were instantly thrown into strong convulsions. This experiment was performed in the absence of the professor, but it was noticed by the lady, who was much struck by the appearance, and communicated it to her husband. He repeated the experiment, varied it in different ways, and perceived that the convulsions only took place when a spark was drawn from the prime conductor, while the nerve was at the same time touched with a substance which was a conductor of electricity.

Sea Worms.—These animals which are so pernicious to our shipping, appear to have the same office allotted to them in the waters, which the tumites have on the land. Were it not for their rapacity, many rivers, and parts of the ocean itself would be choked with the bodies of trees which are annually carried down by the rapid torrents, and many of them would last for ages, and probably be productive of evils, of which, we cannot in the present harmonious state of things form any idea; whereas now, being consumed by these animals, they are easily broken to pieces by the waves, and their entire dissolution is afterwards rapidly effected by a variety of causes.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1284.

IMPROVED WALKING WHEEL OR CRANE.—To the person who shall invent an improved walking wheel or crane, on which the weight or power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or less weight to be raised or lowered.—The Gold Medal, or Thirty Guineas.

VENTILATING COAL MINES.—To the person who shall invent and carry into practice a method of ventilating coal mines, so as effectually to prevent the accidents liable to arise from the accumulation of carburetted hydrogen, and other gases.—The Gold Medal, or Fifty Guineas.

WICKS FOR CANDLES.—To the person who shall make known to the Society the most satisfactory result of a series of experiments actually made by him to determine the best thickness of cotton wicks for candles, so as to obviate the defects of those commonly used.—The Silver Medal, or Ten Guineas.

RECENT PATENTS.

ARTIFICIAL STONE.—To Joseph Apsden, of Leeds, Yorkshire, bricklayer, for an improvement in the modes of procuring an artificial stone.—Dated October 21st, 1824.

EXTINGUISHING FIRES.—To George Dodd, of St. Anne Street, Westminster, engineer, for certain improvements in fire-extinguishing machinery.—Dated October 21st, 1824.

FIRE ARMS.—To the Rev. J. Somerville, A. M. Minister of Currie, Edinburgh, for a means of preventing the accidental discharge of fire-arms.—Dated November 4th, 1824.

AIR-FURNACE.—To John White, jun. and Thomas Sowerby, of Bishop Wearmouth, Durham, for an improved air-furnace for the fusing of metallic substances.—Dated November 6th, 1824.

BRICK-MAKING.—To William Leathy, of Great Guildford Street, Southwark, engineer, for improved apparatus in the making and drying of bricks.—Dated November 16th, 1824.

TO OUR READERS AND CORRESPONDENTS.

We thank W. L. for his suggestion, which is under consideration.—Mr. J. W.'s Letter is received. *Some* of the terms to which he objects as being too scientific, are the proper commercial names of things; he will find also upon reference, that a great portion of the matter is original, and that the information therein conveyed is not to be found in any other work of the kind.

Mr. P.'s *unpaid* G. P. O. letter inquiring whether a certain pretended *perpetual motion* apparatus, which is stated to be "*wound up like clock-work at proper intervals*," "is likely to be of use in the propelling of machinery," has been received; and will be returned 'ere we can resolve a question requiring such deep study.

Alcohol's proposed substitute for the patent hydro-pneumatic liquor-cock can have no action in an air-tight vessel; *possibly*, he only intended to be a little facetious at our expence. If he will however give us something really tangible, or clear up the mystery of his recent favour, he will receive both our attention and thanks.

The subject of J. O. H.'s letter will be attended to in an early subsequent Number.

Communications received from T. Bolton—J. W. Auger—Gas Bottle—Old Admirer—Euclid—Copper Bottom—and Theophilus.

*** As another year will have closed upon our labours, 'ere the next Number makes it appearance, we deem it proper not to let the present season pass, without expressing those grateful acknowledgements which are due to our numerous Readers for their kind patronage of our little Work up to the present period: under their fostering support the Register has attained to its present respectable bulk; and we are happy to add, that while its pages have been numerically increasing, the circle of its Subscribers has been extending in a greater proportion. The confidence which this success inspires, will excite us to continue unabated, our exertions to give the earliest intelligence on all such subjects as fall within our province. We have been the first to publish to the world some of the finest inventions which the genius of man ever yet devised; and while we are anxious to avoid professions, we cannot refrain from expressing our assurance that our succeeding Numbers will surpass most of their predecessors, both in interest and originality. We are deeply sensible of very many deficiencies, as well as excrescences; our efforts will be directed to supply the former, and to prevent the recurrence of the latter.

Our sincere thanks are especially tendered to those scientific and literary gentlemen, whose communications have added so much value to our otherwise very humble work, and we earnestly solicit a continuance of their friendly assistance.

Circumstances have hitherto prevented our adoption of some valuable suggestions from Correspondents, but we trust it will be seen in the progress of the work that we have not been unmindful of their merit.

[*To be continued every* FORTNIGHT.]

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REGISTER

OF

THE ARTS AND SCIENCES.

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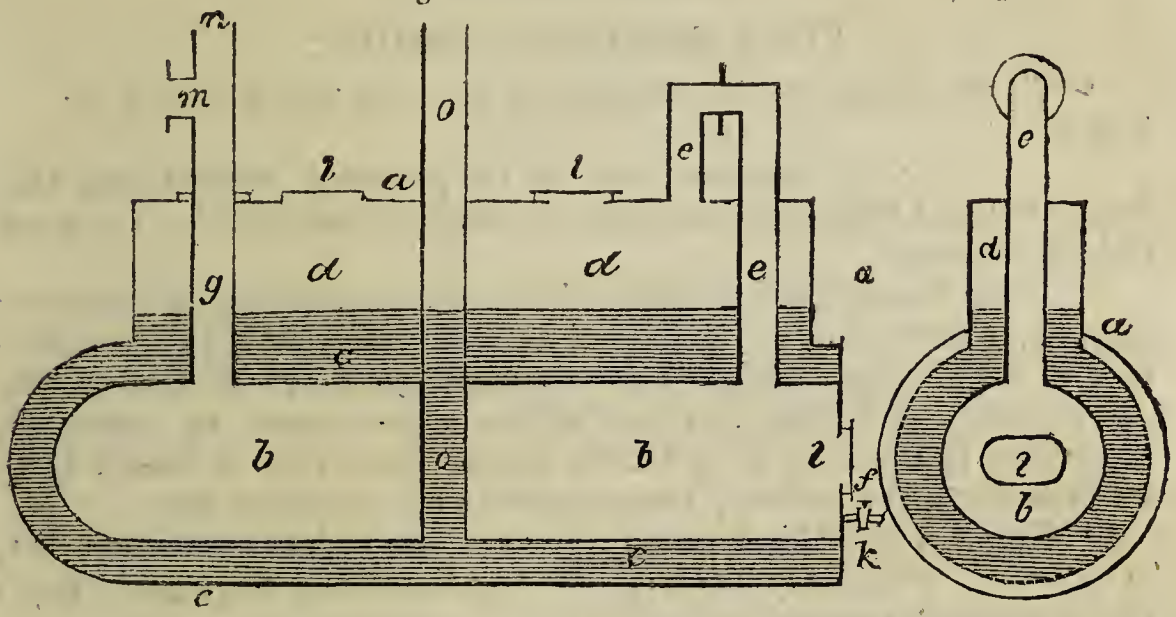
CONTENTS:

Horton's Patent Steam Boiler..	146	Chater's Patent Ship's Hearth..	153
Flat bottomed Ships.....	147	Encyclopædia of the Useful Arts	154
Alcohol's Syringe-Cock	*ib.*	Nat. Philosophy on Telescopes	158
Sea-Alarum.....	149	Answers to Inquiries.....	159
Palmer's Patent Railway.....	150	Adulterations of Tea.....	160
Table of Resistance upon several of the principal Railways	152	Patents, Premiums, and Correspondents	160

Fig. 1. *Fig.* 2.



HORTON AND FISHER'S NEW STEAM ENGINE BOILER.

THIS excellent invention is the subject of a patent granted to Messrs. Horton and Fisher, of Great Bridge, near Birmingham, who are manufacturers of articles of the kind. Its peculiarity and chief merit seem to consist in the placing of a reservoir for the steam generated, within the boiler, which being constantly surrounded with hot water it loses none of its heat by radiation. These boilers are applicable alike to high or low-pressure engines, with such modifications of their form and strength of materials as the case may require.

Fig. 1 represents a longitudinal section of the Steam Boiler, and *Fig.* 2 an end view of the same. The letters of reference apply to the same parts in each of the figures.

a a a a, figs. 1 and 2, is the steam boiler round which the furnace and flues are to be constructed, and *b b b* the internal vessel or reser-

voir for containing the steam generated; *c c c* exhibits that part of the boiler which is filled with water, and which is replenished by means of the tube *o o* from another reservoir placed above. The heat having caused the steam to fill the upper part of the boiler, *d d*, it passes from thence through the bent tube, *e e*, into the steam reservoir below *b b*; from whence it is conveyed to the engine (or for other purposes) through the tube *g* and *m*. At the upper part of the tube *g*, at *n*, a safety valve is placed for regulating the force of the steam. At *f* is a cock for drawing off whatever water may be formed in the steam boiler, and under this at *k* is an aperture for cleaning out the boiler. *l l l l* are man holes for gaining access whenever necessary into the interior.

The Patentees do not confine themselves to the placing of a single steam reservoir within the boiler, but as the specification states "one or more vessels;" which admits of a very convenient application of steam to a variety of different purposes.

FLAT BOTTOMED SHIPS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IT appears now to be perfectly ascertained, that Flat-bottomed Ships can navigate the ocean by the arrival of the great Ship Colombus.

"I beg through the medium of your very valuable publication to suggest, particularly to those who may be interested in the construction of such Ships designed for the transportation of timber, the practicability of building a vessel with a square stern, or nearly so, something in the form of a Dutch galliot, only that it should carry its breadth to the bottom, thereby giving the vessel no *run*.

"To steer the Ship I propose to have two rudders at the corners, or quarters, which may be steered by two tillers and one wheel, much the same as at present.

"I have no doubt but that a much less rudder will be found to answer the purpose than is used at present.

"The tillers should be so arranged that when the one loses its power the other gains it, the advantages of this construction to a timber Ship must be obvious.

"16, *Doughty Street.* "L. O."

PROPOSED NEW SYRINGE-COCK.

"*London, December 15th,* 1824.

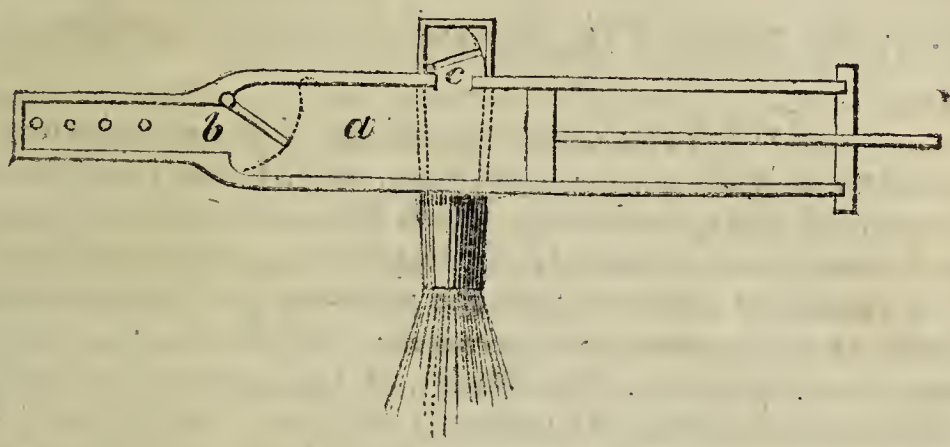
"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I PREFER submitting Inventions to the opinion of the Public to laying them before Societies for their encouragement, because I believe the merit of such inventions is measured in the estimation of the former by their *utility alone.*

" ' Mr. Russell's *Patent Hydro-Pneumatic Liquor Cock, with air vent attached*' is a very good sort of invention, and deserves an honorary medal no doubt, but I beg to submit to the public through your useful Publication, a contrivance which I conceive still more efficacious towards the end proposed.

Fig. 1.



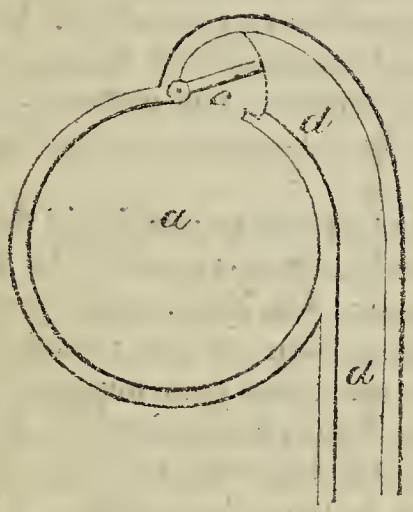


Fig. 2.

" *Fig.* 1. *a* represents a longitudinal section of a common piston, which is fitted to a cask as a tap cock, *b* is a valve opening outwards; when the rod is drawn out the liquid forces this valve open and flows into the vacuum: the rod is then pushed back when this valve closes, and the valve *c* connected with a tube (passing outside the cylinder) for conveying off the liquid, opens and supplies what is required into the vessel underneath.

Fig. 2 is a transverse section of the cylinder *a*; *c*, valve connected with the tube *d d* for discharging the liquid.

I leave to *Patentees* the *invention* of a mode for securing this contrivance against cellar depredators, and to giving it a form better adapted to the indolence of footmen.

" I am, Sir,
" Your obedient humble Servant,
" ALCOHOL."

The above Communication we received on the date mentioned, and conceiving the invention it describes to be very defective, we

were half disposed to look upon it as (to say the least) a most indigested contrivance; and under that impression we noticed the subject in our answers to Correspondents in our last number. In consequence of our observations Alcohol has sent us a second letter, which we here subjoin:—

"'*London, Dec. 28th,* 1824.

"'*To the Editor of the Register of the Arts and Sciences, &c.*

"'SIR,

"'YOUR courteous notice of my contrivance shall be 'replied to as it deserves;—but first, as it is my intention to prove 'the truth of the principle on which this contrivance is constructed, 'I will name the instrument, if you please, a Syringe-Cock.

"'It will be admitted that the power of gravitation acts in *vacuo* 'as well as *under atmospheric pressure*, its influence in the latter case 'being proportioned to the density of the gravitating body, while 'in the former instance its power is uniformly exerted on all bodies.

"'To apply this—the Syringe-Cock being "fitted as a common 'tap cock" near the bottom of the vessel, the air is exhausted from 'the cylinder by drawing out the piston; into this vacuum the liquid 'finds its way, *not by the pressure of air but by the power of gravita-'tion*.

"'A case—what prevents the liquid flowing out of a cask, with-'out a vent-hole, when it is tapped? Is it not the pressure of the 'air?—remove the air, you remove the pressure. Q. E. D.

"'Your misconception of the principle on which the Syringe-'Cock acts, has arisen from your supposing that the liquid is *raised* 'by it, whereas the liquid FALLS into it; but as the description which 'accompanied my drawing was not full, I am willing to admit that 'the misconception is very excusable. The above explanation will, 'I trust, satisfy you that I did not intend "to be facetious at 'your expence:" the good temper which you display under that sup-'position, however, shall make me your correspondent whenever I 'have any thing to communicate worthy of your notice.—If I should 'have succeeded in convincing you of the practicability of the Syringe-'Cock, and by this means induce you to insert its description in your 'Register, any additional particulars which it may require to render 'it clear I will leave to yourself.

"'I am, Sir,

"'Your obedient and humble Servant,

"'ALCOHOL.'"

We now beg to assure Alcohol that we did not misconceive the principle of his "Syringe-cock," but that we understood the matter exactly as he has explained it in his second letter, and our objections to its utility remain unaltered by any thing he has said. The object of an Editor of a little work like this is to make selections from among the numerous inventions with which the present day teems, of such only as appear to be deserving of public patronage, and with that

view we at first declined the insertion of Alcohol's Communication; but as it might appear illiberal not to give it a place after his second letter, our readers will, we hope, excuse its introduction, should their opinion of its merits coincide with our own—which we consider it necessary now to state briefly:

In the first place, it should be noticed that Alcohol's contrivance is proposed as an improvement, and a substitute for Mr. Russell's patent invention, which latter has been approved and sanctioned by an extensive use. Russell's possesses great simplicity and security, with perfect action, at a very moderate expence. Alcohol's is precisely the reverse in every particular. Alcohol's is infinitely the most complex, which requires no argument to prove; it is but *half* an invention, possessing *no* security, which he "*leaves to Patentees.*" Its action would be so imperfect, destructive, and laborious, as to become soon totally useless; and when the security which "Patentees" are to bestow upon it, is added, the expence of the apparatus would be at least ten times the amount of Russell's; of this he may satisfy himself upon enquiry of any mechanic. Instead of drawing off the liquor in one continuous stream, it would be forced out in gushes of *froth,* (to use a well understood word) about a wine glass full at a time; (supposing the diameter of the cylinder to be one inch :) and as there is no contrivance for admitting air into the cask a vacuum would be caused therein, the fermented liquor would expand into this froth, and before the cask was half emptied, (supposing it possible to draw off so much) it is probable the pressure of the atmosphere from without would dash in the head or the bottom; the pressure at either end of an eighteen gallon cask being equal to more than 3000 pounds weight, a force which no cask however strong could sustain. In consideration to our readers we shall conclude our remarks with the very common observation, that the cleverest men sometimes commit the greatest errors, for want of a due consideration of their subject in all its bearings, which appears to us to be completely verified in the present instance.

SEA ALARUM.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I ONCE hazarded my precious life by crossing the British Channel,

—'and the waves
'Bounded *not* beneath me, as a steed
'That knew his rider,'

but forced their way through the bottom of the vessel. In the middle of the night I was awoke in my birth by the noise of a vigorous working of the pumps, which made me think with Gonzalo, that I would give

> 'Twenty leagues of sea for an acre of dry ground—*long heath*—brown furze—any thing—the wills of Heaven be done! but I would fain die a dry death.'

A considerable quantity of water had collected in the hold, before the

crew were aware of the leak, and some hours elapsed before we considered ourselves safe from a watery grave, of all others *then* the most unpleasant.

"Congratulating myself the other day upon this 'hair-breadth 'scape,' and kindly sympathizing with my own sufferings on that terrific occasion, a thought popped into my head, which may possibly be turned to good account by some of your mechanical folks; and I have for that reason scratched out this letter for insertion in the Register, or such part of it as you, Mr. Editor, may think proper; or you will perhaps do me the favor of giving the hint yourself, as I am but a sorry scribbler. My proposition is, that a tube be placed in that part of the hold, or well, where the water is collected, which tube should contain a float that would ascend as the water accumulated, and having reached a certain elevation would strike against a catch, and relieving a crank instantly set off an alarum, and thus call the attention of the crew to the circumstance *in good time;* or a cannon might be let off, if mounted with a lock by attaching a wire to it, which perhaps would be more pleasant to Jack than the ringing of a bell. There are doubtless many other methods of effecting this object; and I should be very glad to see in the Register a plan from some of your intelligent nautical correspondents, as I am too ignorant in such matters myself to go much into detail, being

"*Percival-Street,* "A LAND LUBBER."

"*January 2nd,* 1825.

PALMER'S PATENT RAILWAY.

As the subject of Railways has of late deservedly occupied much of the public attention, and many able papers thereon having been published in the diurnal and other periodicals, in which no sort of notice has been taken of Mr. Palmer's beautiful invention (some account of which appeared in the 7th Number of the Register), we feel it to be our duty to recommend the perusal of Mr. Palmer's Observations upon Railways generally, published by Mr. Taylor of Holborn. The results therein given of a series of experiments upon several of the principal Railways of the kingdom, made by that eminent engineer, by a dynamometer (of an improved construction, by himself), are particularly deserving of attention, more especially at the present moment, when vast sums are about being expended upon Railways of the old construction, in which the resistance or friction is nearly double.

The extract which we shall here give from that work will afford to those who have not had the pleasure of reading it, some idea of the valuable information it contains.

"Perhaps if some accurate means of ascertaining the resistance of roads and railways were on all occasions used, their improvement would be much advanced. The real value of either being then unequivocally compared, the amount of defect could no longer be a matter of mere opinion. The proprietors would then know whether an

apparent inferiority arose from the difference of horses or difference of circumstances; and it would be of great advantage to introduce a clause in contracts, which would determine the effect to be produced. The methods by which resistance of roads and railways have been ascertained, have not been sufficiently accurate, or have been too inconvenient for general use. The dynamometers, which denote the resistance by the degree of extension given to springs attached to the carriage, are convenient as portable instruments, but do not denote the measure with the necessary precision. The resistances are not equable from the irregularities of the surface; neither does the force which draws the carriage continue equable. When horses are employed, those instruments are of no service whatever. The effect of the unequal force or resistance occasions a vibratory motion to the indicating point, and we can never have confidence in any result they exhibit. Similar defects are observable in all the instruments I have seen.

"Having had frequent occasion to ascertain these resistances, I constructed an instrument which, by removing the imperfection referred to, has been completely successful. The problem was to make such an instrument as would indicate very small differences, but which would not yield *suddenly* to a change of resistance. I therefore connected to a spring dynamometer, a semicircular close copper vessel containing water; at the centre is a spindle, on which an arm or fan is fixed, and which very nearly corresponds with the inside of the vessel. The springs are so connected with the spindle, that they cannot be acted upon without the arm or fan turning upon its centre, and passing through water. In order to pass through the water, the latter must escape by its sides, and the space being extremely small, *it cannot pass rapidly, but will yield to the smallest force.*

"By way of exhibiting the difference of resistance upon different railways, I have attached a table containing experiments on several.

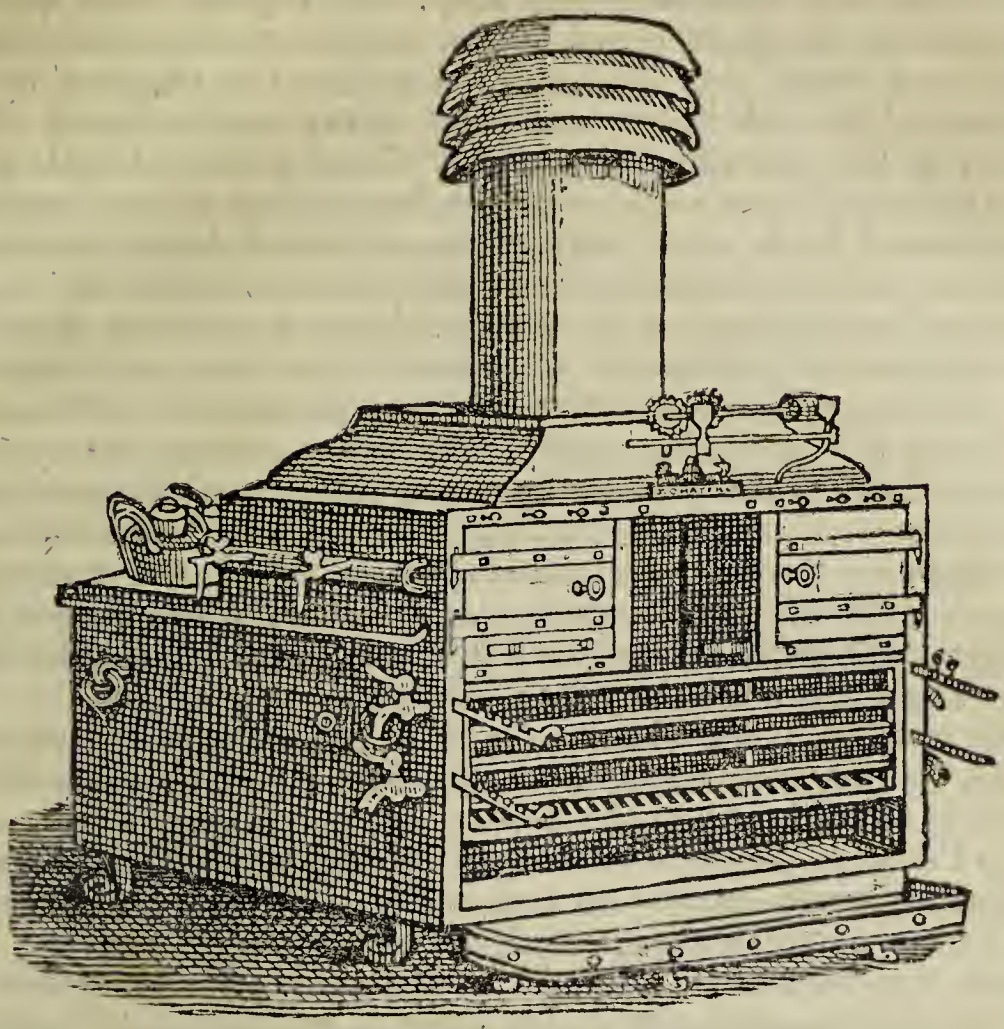
"The first column contains the articles conveyed; the second, the resistance in proportion to the weight; the third, the whole effect produced, *i. e.* including the weight of the carriage by one horse, or one hundred and fifty pounds, at two miles and a half per hour; the fourth, the useful effect, or the load conveyed, in pounds; the fifth, the same in ordinary measures; the sixth, the inclination, expressed by decimal fractions, on which a railway, whose resistance is equal to that specified, should be constructed, that the resistance of the loaded carriages downwards, may be equal to that of the empty carriages upwards; the seventh, the effect produced under such circumstances; the eighth, the useful effect under the same, the weight of the carriages being deducted. In each experiment, the power of the horse is assumed at one hundred and fifty pounds, moving at the rate of two miles and a half per hour.

Note.—In the inclinations, the weight of the horse itself, as part of the effect produced, is not taken into account, that the table may equally serve where mechanical force is employed. Some allowance must therefore be made where horses are used, but the difference in the inclinations given will be very trifling.

TABLE, exhibiting the amount of Resistance in a straight line upon several Railways, also shewing the effect which can be produced by a force of 150 *lbs. at two miles and a half per hour, being that exerted by an average good horse, through an ordinary day's work.*

		1	2	3	4	5			6	7			8		
No. of Exper.	LIST OF RAILWAYS.	Materials conveyed.	Resistance in proportion to the weight.	Effect produced on a level by a force of 150 lbs. at 2½ miles per hour.	Useful effect or weight in pounds, carriages deducted.	Useful effect in tons and parts.			Proper inclination for a descending trade.	Effect produced on the proper inclination by 150 lbs. carriages included.			Useful effect on the inclination.		
						Ton.	cwt.	lbs.							
1	Llanelly Tram Road, S. Wales,	Coals.	$\frac{1}{59}$	8850	4602	2	1	10	,005953	6	1	92	3	3	38
2	Surrey Tram Road,	Chalk.	$\frac{1}{60}$	9000	6750	3	0	30	,010000	10	0	100	7	10	75
3	Penrhyn Slate Quarries, edge Rail Road, curved surface,	Slate.	$\frac{1}{87}$	13050	10084	4	10	4	,007237	15	14	68	12	3	12
4	Cheltenham Tram Road,	Coals.	$\frac{1}{90}$	13500	8679	3	17	55	,005263	11	9	4	7	7	27
5	New Branch of Ditto, slightly covered with dust,	Do.	$\frac{1}{122}$	18300	11765	5	5	5	,003883	15	10	53	9	19	67
6	Ditto swept clean,	Do.	$\frac{1}{146}$	21900	14079	6	5	79	,003244	18	11	59	11	18	95
7	Edge Rail Roads, near Newcastle upon Tyne,	Do.	$\frac{1}{170}$	25500	17773	7	18	77	,003146	24	9	59	17	1	21
8	Railway invented by H. R. Palmer,	Do.	$\frac{1}{300}$	45000	33750	15	1	38	,002000	50	4	52	37	13	39

NOTE.—*I am indebted to* MR. GRIMSHAW, *of Sunderland, for the data of No. 7.*



MR. JOSEPH CHATER'S PATENT IMPROVED SHIPS' HEARTH.

The introduction of steam in our maritime accommodations is now becoming as general as in our domestic economy. The engraving which precedes this article is in illustration of one of the most improved inventions of the kind. Not having been furnished with a plan or a section of this machine, which contains numerous vessels and compartments, it is out of our power to give a particular description of its construction.

The apparatus comprises a cylindrical steam boiler, coppers, ovens, hot closets, tanks, &c. all of which are heated by one open fire. It is calculated for a ship of war, and to cook for three hundred men. The Patentee however makes them to suit vessels of all dimensions.

The primary object in the invention seems to be, to cook with less fuel, by means of steam produced from sea water; which steam is portioned out by means of cocks attached to each vessel, in which any article of food may be cooked. All the vessels or coppers are double, and the spaces between them being filled with water, constitutes them steam boilers, thereby economising the fuel, and preserving the inner vessels. The steam generated is either employed for heating other vessels, or it is condensed for the purpose of obtaining fresh water. The unnecessary waste of fresh water at sea, being a serious inconvenience, the apparatus is so contrived that

in preparing such food as cocoa, soup, &c. wherein fresh water is indispensable, the steam raised in the operation is immediately condensed, and returns into the vessel, as well as that obtained by the ebullition of the salt water, contained in the exterior vessel. The economy of this operation is, that only thirty gallons of fresh water are put into the interior vessel, to make forty gallons of soup or cocoa, ten gallons of fresh water having been obtained in the process by evaporation and subsequent condensation from the salt water.

As the water obtained by the condensation of steam from salt water is both unwholesome and unpleasant to the taste, until impregnated with atmospheric air, means have been provided by the Patentee for effecting this desirable object. The spaces between the coppers and steam boilers communicate, by means of tubes, with tanks placed on the lower deck, to receive the distilled water; and the water as it descends passes through a perforated spherical vessel, where minutely divided it meets with a current of air from below, which divests it of its disagreeable qualities, renders it perfectly fresh, and enables it to be kept sweet and wholesome for a long time.

This machine is likewise employed in promoting the ventilation of ships, in preparing warm or vapour baths; thereby contributing essentially to the health of the crew.

The Patentee proposes to construct Machines of this kind (with the necessary modifications) to cook victuals for the army; a small model of one mounted upon wheels we have seen at his office,* two of which, it is calculated, will cook in the most perfect manner sufficient for one thousand men in the space of two hours, the process being carried on during the march.

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. VII.—*(Continued from page 135.)*

AMBERGRIS, is a name derived from the French *Ambre-gris*, or grey amber. It is a concrete, fatty, inflammable substance, of the consistency of wax. It is usually of a grey colour, but sometimes of a yellow and dark brown, intermingled with spots; other sorts are variegated like marble. It has a rugged and uneven surface, and possesses a powerful odour, particularly when heated. Respecting the origin of this substance there has been a great disagreement among philosphers, but the general opinion now entertained is, that it is an animal matter produced in the intestines of the spermaceti whale; and as it has never been found in any but such as were dead or sick, it is considered to be caused by some disease. This substance has evidently been once in a liquid state, as various extraneous matters are found incorporated with it; such as the neb of the cuttle fish, bones of fishes, and other marine bodies. Ambergris is likewise found floating on the waters of the ocean, or on the shores of various tropical countries, generally in small fragments, but sometimes in large pieces, weighing as much as two hundred pounds. When

* No. 13, New City Chambers.

taken from the whale it is not so hard as that found in the sea, which becomes indurated by exposure to the air. Its specific gravity varies from 780 to 926. As the real ambergris is very dear (in London as much as a guinea an ounce), it is counterfeited and adulterated in various ways. When genuine, it displays the following properties: it is scaly, insipid, and sweet-smelling; it melts without rising in bubbles and froth; when exposed to the flame of a taper in a silver spoon, it swims on water, and does not stick to hot iron, which immediately reduces it to a fat and very odorous liquid. Although very brittle, it becomes smooth, like soap, on rubbing it with the nail. The counterfeit is made by various adulterations, such as musk, civet, storax, laudanum, &c. It is one of the most agreeable perfumes, yet it should be proportioned so sparingly, so that while it improves the scent of that to which it is added, its own may not be perceptible. It is very remarkable, that this drug, which is considered to be the sweetest of all perfumes, has been very closely imitated by Homberg, by a long digestion of the most odious of all fœtid substances. Ambergris is very extensively employed by perfumers, who melt it over a gentle fire, and make extracts, essences, &c. The alcoholic tincture of it is added in very minute quantities to lavender water, tooth powder, hair powder, soap, &c. to which it communicates its peculiar fragrance.

Ambergris enters into the composition of many cordial, sudorific, and alexiterial waters. The faculty of Paris direct a tincture to be drawn by digesting two scruples of ambergris in two ounces of strong spirit of wine, impregnated with roses A compound tincture is also made with a like quantity of ambergris, half as much musk, ten grains of civet, six drops of oil of cinnamon, and four drops of oil of rhodium, digested in four and a half ounces of highly-rectified spirit, impregnated with roses and orange flowers. This tincture forms a very high perfume, two or three drops giving a fine scent to a large portion of inodorous matter. In the preparation of these tinctures, it is adviseable that the ambergris should be first well diffused in the spirit, before the more soluble substances are added. The Orientals look upon ambergris as an aphrodisiac, and consider that the frequent use of it contributes to longevity. In Africa and many parts of Asia, ambergris is not only used as a medicine and as a perfume, but considerable use is also made of it in cookery, in lieu of spice.

Ambergris melts at 144° of heat, at 212° it is volatilized in the form of a white vapour. On red hot coal it burns, and is entirely dissipated; water appears to have no action upon it; the acids, with the exception of the nitric, has a very feeble action on it; with the alkalies it combines, and forms soap; is soluble in ether, the volatile oils, as well as the fixed oils; ammonia will also dissolve it by the assistance of heat; alcohol dissolves that portion only which consists of an oily or resinous nature, and is therefore very serviceable in analyzing its constituent parts. Bouillon la Grange, who recently made an analysis of it, found that 3820 parts of ambergris, consisted of adipocire 2016 parts, resinous matter 1167, benzoic acid 425, and coal 212.

AMETHYST. There are two kinds of Amethysts, the oriental

and the common : the oriental is of a reddish or violet colour ;—in hardness, form of its crystals, and brilliancy, it nearly approaches to the oriental ruby and sapphire ; the only difference being in the colour. It is a very rare gem, and is seldom brought to Europe. The natural colour of this precious stone is entirely dissipated by exposure to heat, and being thus rendered perfectly transparent, and very brilliant, it approximates in all respects so nearly to the diamond as to be mistaken for it, even by judges : in consequence of this resemblance it is frequently substituted for diamonds by jewellers in their work.

The common Amethyst is crystallized quartz, or rock crystal, with a natural tinge of a full violet colour ; exposed to fire it loses its colour, like the oriental, but instead of being transparent it becomes an opaque white. The best European Amethysts come from the vicinity of Carthagena, in Spain. *See* QUARTZ and SAPPHIRE.

To make an artificial Amethyst, ten pounds of clear glass (made without manganese) are to be fused down with an ounce and a half of black manganese, and one drachm of zaffer. Porta recommends as a good proportion one drachm of manganese to one pound of the clear glass or paste.

AMIANTHUS, or Mountain-flax, is a fibrous elastic mineral substance, of a silvery whiteness or greenish colour ; lustre glimmering, of a pearly or silken appearance. It is soft enough to be scratched by the nail, and considerably elastic. It has a soft and somewhat greasy feel ;—specific gravity about 2,400. This mineral is usually met with dispersed in rocks of serpentine, but it is found in Germany in the strata of iron ore, sometimes forming a vein of an inch in diameter. It is found also at Crete, Cyprus, Elba, and Corsica ; in France, Sweden, Siberia, and in the mountains of Arcadia ; also in various parts of Great Britain, but particularly at Anglesea in Wales, and Aberdeenshire in Scotland. The Tarentaise Amianthus from Savoy is the most beautiful.

Exposed to the action of the blow-pipe the Tarentaise Amianthus fuses into an opaque substance. It dissolves quickly in borax and microcosmic salt, but effervesces with carbonated soda. The mineral acids have a very feeble action on Amianthus. It appears from Bergman that caustic potash affords the means of dissolving this substance, which he effected by mixing equal parts of Amianthus, carbonated potash, and charcoal, and igniting them for two hours, by which he obtained a mass that was perfectly soluble in nitro-muriatic acid ; 100 parts of the Tarentaise Amianthus yielded, according to Bergman, sulphated barytes 6.0 ; carbonated lime 6.9 ; carbonated magnesia 18.6 ; alumine 3.3 ; silex 64.0 ; oxide of iron 1.2.

The ingenuity of man, two thousand years since, led to the fabrication of a peculiar kind of cloth from the filaments of this extraordinary mineral ; possessing the wonderful quality of being inconsumable in fire. When the cloth became dirtied or greased it was usual to throw it into a bright fire ; the stains were thus burnt out, and the cloth purified and rendered of a dazzling whiteness. Pliny states that he had been an eye witness to this operation. In the luxurious times of the Roman empire, this cloth was purchased at an

enormous price, for the purpose of wrapping up the bodies of the dead, before being laid on the funeral pile; the ashes of the body were thus preserved unmixed with those of the wood. Of the reality of this practice there cannot exist a doubt; in 1702 a skull and other calcined bones, together with a quantity of ashes, were discovered at Porta Nævia at Rome, which were enwrapped in Amianthus cloth; which interesting relic of antiquity is now preserved in the Vatican Library.

The practice of burning the dead becoming disused, the manufacture of Amianthus cloth was neglected, and the art was lost in Europe. It is said, however, that the art is still preserved in the East, and the cloth employed by the Tartars in burning the bodies of the dead.

In 1691, Sig. Ciampini of Rome, published the following method of manufacturing this incombustible cloth. The Amianthus is to be first laid in warm water to soak for some time; it is then to be opened and divided by the hands by gentle rubbing; all the extraneous earthy matters will thus be loosened and washed out, which in the natural state serve to bind the fibres together. This operation is to be repeated several times by pouring on boiling water, and opening and squeezing the mineral till the water runs off quite clear. Nothing will now be left but long flax-like fibres, which are to be laid in a sieve and dried in the sun. It is then to be carded (or combed) on very fine cards, and the long filaments are to be steeped in oil to render them more flexible. It is then to be placed between the card in such a manner that a portion of it may hang out at the sides. The spinning of it is performed by fixing a small reel with a little hook at the end on the same bench as the cards. The reel is to be wound over with white thread, which twisting about the thread placed in contact with the Amianthus, the latter, by the assistance of the thumb and fore-finger of the operator, is wound up and twisted with it into one thread. A continuous thread being thus produced, it is carefully woven into cloth; placed afterwards in a clear charcoal fire, both the oil and the thread of linen or cotton that was combined with it in the spinning and weaving are consumed, and there remains a pure tissue of white Amianthus. This method being however very tedious, another has been recommended; which is to place a quantity of flax on a distaff, and taking three or four filaments of the Amianthus between the fingers; they may be easily mixed and twisted along with the flax. The thread thus spun will be much stronger and more durable than that made by the above-mentioned process; the carding will also be unnecessary, by which many of the filaments are unavoidably broken.

The short filaments that remain after the washing or carding of the stone have been made into paper by the ordinary method of manufacturing that substance, except that a larger portion of size is employed. As it would be worth while to preserve documents of great importance by writing on the Amianthus paper with an indelible ink, that would also resist the effects of fire, the following receipt has been given for that purpose. To one part of sulphate of iron, add

two parts of alum, which having dissolved in hot water, add pearl-ash as long as any precipitate takes place; the mixture is next to be boiled, then filtered, and the precipitate well washed with warm water; distilled vinegar is then to be added to the precipitate, which will dissolve it, and form an indelible ink. Amianthus paper being written upon with this preparation, the characters will be preserved after combustion, of a brown colour, and perfectly legible.

Threads of the Amianthus are sometimes used as perpetual wicks for lamps. Amianthus is frequently confounded with the more flexible kinds of Asbestos. By some writers the terms are used synonimously. Others divides the Asbestos into several varieties, of which Amianthus is one. See Asbestos.

[*To be continued.*]

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 22.—Optics.

(Continued from page 94, Vol. 2.)

Of Telescopes.

In a refracting Telescope, the glass which is nearest the object in viewing it, is called the object glass: and that which is nearest the eye, is called the eye-glass. The object-glass must be convex, but the eye-glass may be either convex or concave; and generally, in looking through a Telescope, the eye is in the focus of the eye-glass, though that is not very material, for the distance of the eye, to distinct vision, is indifferent, provided the rays of the pencils fall upon it parallel; only, the nearer the eye is to the end of the Telescope, the larger the scope or area of the field of view.

But this Telescope has one inconvenience which renders it unfit for most purposes; which is, that the pencils of rays being made to diverge by passing through the concave glass, no very few of them can enter the pupil of the eye; and therefore the field of view is but very small, as will appear evident. For none of the pencils which flow either from the top or bottom of the object can enter the pupil of the eye, but are stopped by falling upon the iris above and below the pupil; and therefore only the middle part of the object can be seen when the Telescope lies directly towards it, by means of those rays which proceed from the middle of the object. So that to see the whole of it, the Telescope must be moved upwards and downwards unless the objeect be very remote; and then it is never seen distinctly.

But as this Telescope inverts the image with respect to the object, it gives an unpleasant view of terrestial objects; and is only fit for viewing the heavenly bodies, in which we regard not their position, because on account of their being round, they do not appear inverted. But whatever way the object seems to move, this Telescope must be moved the contrary way, in order to keep sight of it; for, since the object is inverted, its motion will be so too.

The magnifying power of this Telescope is, as the focal distance of the object-glass to the focal distance of the eye-glass. Therefore, if the former be divided by the latter, the quotient will express the magnifying power.

When we speak of magnifying by a Telescope or Microscope it is only meant with regard to the diameter, not to the area or solidity of the object. But as the instrument magnifies the vertical diameter as much as it does the horizontal, it is easy to find how much the whole visible area or surface is magnified: for, if the diameter be multiplied into one another, the product will express the magnification of the whole visible area. Thus, suppose the focal distance of the object-glass be ten times as great as the focal distance of the eye-glass, then the object will be magnified ten times, both in length and breadth; and ten multiplied by ten, produces one hundred, which shews that the area of the object will appear one hundred times as big when seen through such a Telescope, as it does to the naked eye.

Hence it appears, that if the focal distance of the eye-glass were equal to the focal distance of the object-glass, the magnifying power of the Telescope would be nothing.

This Telescope may be made to magnify in any given degree, provided it be of a sufficient length. For the greater the focal distance of the object-glass, the less may be the focal distance of the eye-glass, though not directly in proportion. Thus, an object-glass of ten feet focal distance, will admit of an eye-glass whose focal distance is little more than two inches and an half; which will magnify near forty-eight times; but an object-glass of one hundred feet focus, will require an eye-glass somewhat more than six inches; and will therefore magnify almost two hundred times.

(To be continued.)

ANSWERS TO ENQUIRIES.

London, 1st January, 1825.

In reply to W. L.'s enquiry I conceive a single rule of three statement quite sufficient to ascertain the number of teeth required in the 48-in. wheel, viz.—

If 5 : 10 :: 48
10

5)480

96

96 the number of teeth required for the 48-in. wheel.

"J. G."

In answer to the Letter of "A Parish Officer," respecting the new Fire Pump at Aldgate, we have to inform him, that the maker is Mr. Russell, the engineer, of St. John Street, whose name is affixed at the bottom of the pump-case. We have no knowledge of the cost.

ADULTERATION OF TEA.—It is said that the Chinese have a method of adulterating Black Tea, by means of a sandy kind of earth, containing minute crystals of magnetic iron, which substance may sometimes be detected at the bottom of a tea-cup by the application of a magnet.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

REFINING COPPER FROM THE ORE.—To the person who shall discover to the Society a method of separating, purifying, and refining copper from the ore, so as to render it fit for those purposes to which fine copper is now applied, and by a process cheaper than and superior to any hitherto known or in use.—The Gold Medal, or Fifty Guineas.

REFINING ZINC FROM THE ORE.—To the person who shall invent and communicate to the Society a process of refining zinc from the ore, superior to any hitherto known or in use, and fit for the purpose of making fine brass.—The Gold Medal, or Fifty Guineas.

PREPARATION OF SULPHURIC ACID.—To the person who shall prepare the largest quantity (not less than one ton) of sulphuric acid, from sulphur, without any nitric salt, of a specific gravity not inferior to the best sulphuric acid of commerce.—The Gold Medal, or Fifty Guineas.

INDELIBLE INK.—To the person who shall discover to the Society a method of making a black ink proper for writing superior to any at present known, indestructible by chemical applications, and not too dear for common use.—The Silver Medal, or Fifteen Guineas.

RECENT PATENTS.

BOBBIN NET LACE.—To John Lingford, of Nottingham, for improvements in machinery for manufacturing that article.—Sealed November 1st, 1824. Six months.

SMOKE PREVENTIVE.—To John Crossley of Cottage Lane, City Road, London, for a new invention for that purpose.—Sealed November 4th, 1824. Six months.

BOOT AND STAY LACES.—To John Head, of Banbury, Oxfordshire, for improved machinery for making cords or plat for boot and stay laces.—Sealed November 4th, 1824. Four months.

NEW FURNACE.—To Pierre Brunet, Esq. of Wimpole Street, London, for a furnace upon a new construction.—Sealed 11th November, 1824. Six months.

LIQUOR COCK.—To Isaac Taylor, jun. of Chipping Ongar, Essex, for a new invented cock or tap for drawing off liquids.—Sealed November 20th, 1824. Two months.

BRICK-MAKING.—To William Rhodes, Esq. of Hackney, Middlesex, for an improvement in the clamps used for burning bricks.—Sealed November 20th, 1824. Six months.

TO OUR READERS AND CORRESPONDENTS.

WE refer H. R. to page 52 of the present Volume.

The observations of "A Sixpenny Nail" upon Mr. Bevan's experiments in our next.

The several Communications received from ADOLESCENS, we have given our attention to—but without being able to understand either of them thoroughly. If Adolescens will favour us with a more explicit description we shall be happy to give insertion to his proposed improvements in our next and succeeding number. If the sketches were larger and a little more accurate, it would prevent mistakes being made by the Draughtsmen and Engraver.—S. S. —M. H.—P. W—r—and Tom Sternpost are received.

[*To be continued every* FORTNIGHT.]

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REGISTER

OF

THE ARTS AND SCIENCES.

No. 35.] SATURDAY, JANUARY 22, 1825. [Price 3*d.*

CONTENTS:

Ayliffe's Improved Weighing Machine, 161,—New Method of Working a Ship's Pump, 163,—Project of an improved mode for purchasing a Ship's Anchor, *ib.*—Adhesion of Nails in Wood, 164,—Southworth's Patent Steam drying Machine, 165,—Apsdin's Patent Portland Cement, 166,—Security from Explosion of Steam Engine Boilers, *ib.*—Hall's Patent Oil Press, 168—Preparation of Damasked Steel, 170—Natural Philosophy, on Telescopes, 158—Miscellaneous—Vibration of Wires in the Air, 172,—Casting of Ornamental Articles in Wood, *ib*;—Natural Ice Caves, 173;—Alternate advances and recessions of the Sea, *ib*;—The Light of the Moon, &c. *ib*;—Detection of Arsenic as a Poison, *ib*;—Preservation of Fish during Carriage, 175;—Patents, Premiums, and Correspondents, 176.

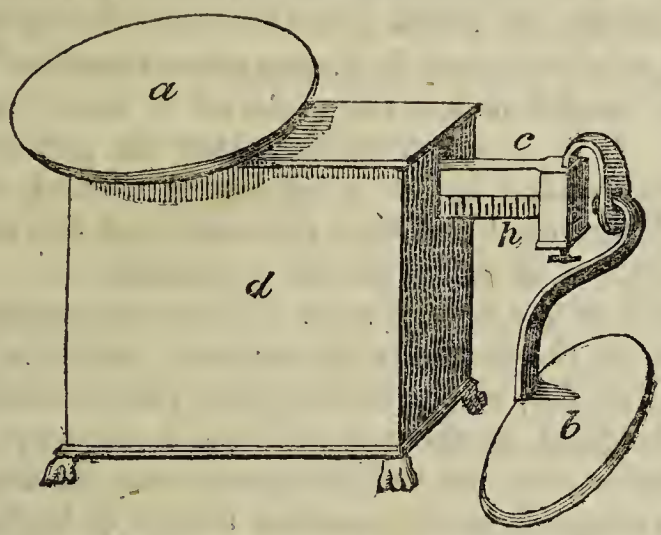


Fig. 1.

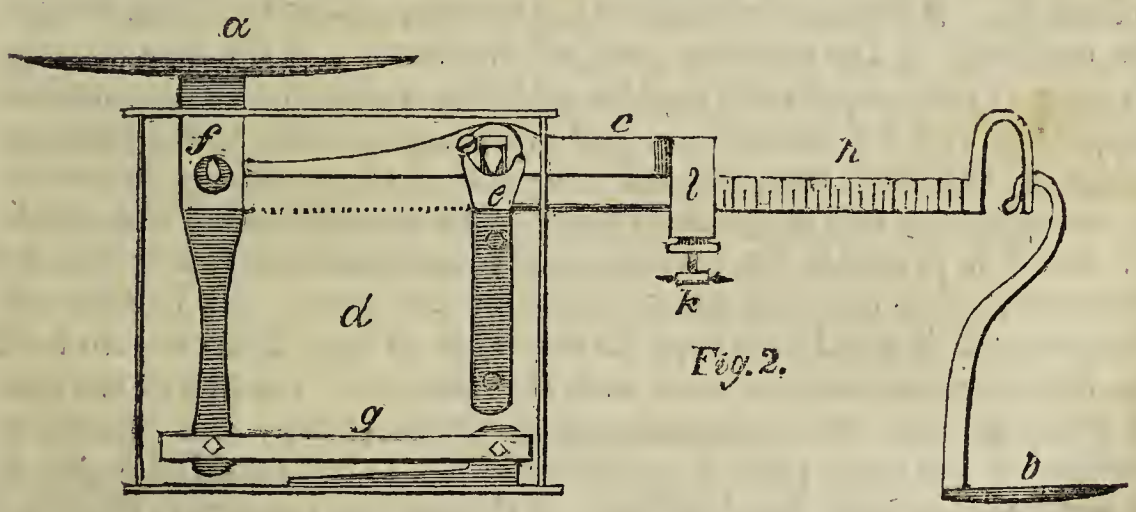


Fig. 2.

AYLIFFE'S IMPROVED WEIGHING MACHINE.

THE above engravings represent a machine which combines the useful properties of the balance or scales, with those of the steelyard. Such is the accuracy and workman-like finish of the model from which the drawings were made, that it appears to be the handy-work of a mathematical instrument maker; it is however the entire production of

Mr. Ayliffe, the smith of Exmouth Street, (who to superior skill in the use of tools, possesses considerable talent in mechanical invention.) It forms the most compact and complete apparatus for weighing we have ever seen; notwithstanding which, the invention would probably have long lain in obscurity, had we not been a witness of its convenient application, by accidentally purchasing something at Mr. Ayliffe's shop, when the machine was put into requisition for weighing it, which was made merely for his own use.

The model before us is precisely the same as shewn in the preceding engravings, excepting that the ornamental part is entirely omitted to prevent misconception of that which belongs to practical use; when employed as scales in which the points of suspension are equidistant from the axis of the beam, as shewn by the perspective view, *fig.* 1. it is calculated for weighing fourteen pounds at a time, or any lesser weight; greater weights might be used, but they would probably be injurious to that nicety of action which causes one of the scales to preponderate by placing on it a piece of writing paper of the size of a shilling. The dimensions of it may be perfectly understood by reference to *fig.* 2. which is a side view of the apparatus when employed as a steelyard, and is *drawn upon a scale of a quarter of an inch to an inch;* which makes the pedestal or case *d* five inches and a quarter wide. It is however evident that the principle of its construction may be extended to the weighing of tons at a time, as well as pounds; and we doubt not that the ability of the inventor is capable of executing them of any required magnitude.

The letters in each of the figures refer to the same parts; *a* is the scale or dish for holding the goods to be weighed, and it is deserving of remark that this situation, above all the other parts, admits of very bulky goods being weighed, as there is nothing in the way to impede its action: it is likewise obvious that this scale may be made of any required figure, and adapted to the peculiar nature of the goods it is to contain. *b* the scale suspended to the other end of the beam to hold the weights. *c* the exterior part of the beam. *d* the iron casing, forming at once a pedestal capable of being elegantly ornamented, a support or rest for the scale *a*, and a protecting cover to the centres, bearings, and other essential delicate parts of the machine; it is made of wrought iron and of great strength. In manufacturing the article for sale it is probable the inventor would economise in this casing by the substitution of some neat designs in cast iron; and underneath the pedestal it would perhaps be desirable to have a drawer to hold the flat weights, that are used with the machine. *e* is one of the pair of bearings upon which the axis of the beam turns; this bearing is rivetted to the front plate *d*, as shewn in *fig.* 1. but removed in *fig.* 2, to shew the internal construction. *f* the upright support to the scale *a*, which rests upon the edges at the end of beam, and is thereby raised or depressed. This upright support is in figure something like the letter Y, the upper portion branching out into two parts which have circular holes or bearings for the reception of the edges, and is kept in its perpendicular position by the reciprocating action of the parallel motion or frame, *g*, with that of the beam, which frame moves

upon steel centres of a peculiar construction, not shewn in the figure. What we have now stated respecting the apparatus relates to its action and construction as an improvement upon the common weighing machine, that is to say, in such as are constructed on the principle of scales, with the axis in the centre of the beam; in which the weights on one side denote the weight of the goods on the other to be the same.

When greater weights are to be ascertained, the 14lb. weight is to be left in the scale *b*, and the steel-yard *h* drawn out until the goods balance, when the graduated lines and figures upon the steelyard shew the exact weight. A thumb screw *k* acts in the square piece *l*, and fixes, by half a turn, the steelyard when not in use, as shewn at *fig.* 1. By this novel, simple, and ingenious application of the steelyard the powers of the machine are at once doubled, with the utmost promptitude, precision, and steadiness of action.

NEW METHOD OF WORKING A SHIP'S PUMP.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"*January* 5, 1825.

"SIR,

"THE subject of pumping the water out of a leaky ship has at different periods attracted the attention of mechanical persons: three gentlemen (and there may be others I have not heard of) have proposed to substitute the capstan for the ordinary method; their plans are all alike, or very nearly so, and are all of them, I doubt not, very great improvements upon the winch, or pump handle; nevertheless, you depend upon the exertions of your crew, who must ultimately tire. Now, Sir, although not a mechanic, I think I could contrive a water-wheel over the side of a ship, which should work the pumps merely by the progress of the ship through the water. This wheel might be made so as to take to pieces and put together with dispatch, and to occupy little space on board. With such a wheel prepared on board, it strikes me that many a ship might be saved from destruction; as, independent of being able to continue pumping without relaxation, the crew might be employed in various ways to stop the leak.

"I have the honour to be, Sir,

"Your obedient,

"F. A. H."

PROJECT OF AN IMPROVED MODE OF PURCHASING A SHIP'S ANCHOR.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"*January 8th,* 1825.

"SIR,

"As it appears to me that sufficient attention has not been devoted to ascertain the most advantageous method of purchasing a Ship's Anchor (more particularly that of a man of war), I

take the liberty of troubling you with the following project of mine, which is intended merely for men of war, as the windlass seems to be the machine the best adapted to such ships as can employ their whole crew at it. Now, considering that the windlass has over the capstan the advantage of less friction in the hawse-hole, getting rid of the messenger, &c. &c. with only the disadvantage of not moving with equal rapidity, I think this last advantage of the capstan may be imparted to the windlass by connecting them together, thus— I place a capstan in midships between the main and fore masts, and connect it to a windlass (placed as far forward as possible) by an endless chain or messenger, which, by means of cogs, should turn one cylinder when the other was put in motion. The capstan should be worked in a frigate and flush-deck vessel on the lower deck, in a two-decked ship on the main deck, and in a three-decked one on the middle deck; thus you would keep your upper deck clear for working ship, and using no nippers, &c. you could employ more men at the capstan; and to remedy the coil of their strength being so unprofitably employed as it is when there are several men at a bar, I would connect the extremities of the bars by means of a circular groove, instead of swifting, and in this should lay a second endless iron messenger, with cogs connecting it with the groove and leading aft; upon this all the men but one at each bar should be employed, by which means their strength would be applied to the extremities of the bars instead of near the head of the capstan. When up and down a tackle might be hooked to this messenger, which would multiply greatly the purchase; or if that was not thought sufficient, this iron messenger might be connected with another capstan, situated where the capstan now is. The friction of the capstan would be reduced by the messenger pulling in a direction opposite to that of the cable.

"As the iron messenger which connects the capstan with the windlass would move that body obliquely upon its axis, a separate windlass might be disposed on each side, which having a considerable inclination from the horizontal, would render that movement of the cylinder more in the direction of its axis.

"I am well aware that in midships, where I propose to place the capstan, there are sheep-pens, hen-coops, &c. these however might be easily disposed of in some other part of the ship, and therefore cannot be advanced as an objection; if, as I imagine, greater power is gained by this purchase without any sacrifice of speed, and with the advantage of keeping the working deck clear.

"I have the honour to be, Sir,

"Your obedient,

"F. A. H."

ADHESION OF NAILS IN WOOD.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I OBSERVE in your 21st Number of the REGISTER an account of some experiments made by Mr. Bevan on the adhesion of

nails in wood, which, allow me say, are too undefined to be of any practical use. Mr. Bevan is, no doubt, a scientific clever man, and the want of precision in the present instance has evidently arisen from an oversight or misconception of the general application of the terms he has made use of. He states, for instance, that sixpenny nails driven one inch into dry Christiana deal at right angles with the grain require a force equal to 187lbs. weight to extract; and he gives the results of similar experiments with other nails, the names of which apply to *no definite form or size*. The application of the terms fivepenny and sixpenny, has originated in their having been sold at so many pence per hundred; but the same term applies to nails of various forms, and their relative adhesion in wood will consequently differ so widely, that Mr. Bevan's results will only serve as data to mislead the calculations of those who make use of sixpenny nails of a different form to those employed by him. Almost every county in England have their nails of a different shape, and the same term is given to them all. Some have round, others square, and flat shanks with quadrangular pyramidical points more or less tapered, spear points, flat or chisel points, &c ;—all these varieties in form will cause a vast disproportion in their relative adhesion. This remark equally applies to their thickness. The common sixpenny nails of my native country, Suffolk, are about four times the thickness and weight of the London sixpenny nails—and their relative adhesion will probably differ in the same ratio, or to the extent of 400 per cent. in this respect only. If Mr. Bevan were to favour your Readers with a sketch of the nails to which his experiments relate, or to mention the specific *proper* name, given to them by the ironmonger, the knowledge which he has acquired upon the subject by his talents and industry, might be rendered useful to others.

"I am, Mr. Editor,

"Your devoted Servant,

"A SIXPENNY NAIL."

"*Carpenter's-buildings,*
"*Jan.* 2, 1825."

SOUTHWORTH'S PATENT STEAM DRYING MACHINERY.

Mr. Southworth, bleacher, of Sharples, in Lancashire, has lately taken out a patent for some very ingenious mechanical arrangements for the drying of cloth by steam heat. At one end of a large drying-room a furnace and boiler are fixed, from which proceed a series of pipes in an horizontal direction, extending over the whole area of floor, and just above its surface. These pipes are supplied with steam from the boiler, and the heat emanating therefrom is employed to dry the cloth, suspended upon rails above, and hanging down in loose folds. In this part of the apparatus we perceive nothing of a novel nature; that which is remarkable, and reflects great credit upon the inventor, consists in the apparatus by which the cloth is uniformly distributed in its pendent position.

Above the hanging rails are extended large timbers or beams,

from wall to wall. These beams form railways, for a peculiarly constructed carriage to travel upon, which, loaded with the cloth wound upon a large roller, distributes it evenly over each rail, allowing it to drop and form a regular festoon before it has passed on to the next rail. The carriage is put in motion by an endless band, embracing two riggers, one of which being driven by the gear of a steam engine gives a similar motion to the other. The carriage is composed of a series of wheels and rollers, admirably adapted for delivering with regularity and exactness. The endless band passes over a band-wheel in the carriage, and gives motion to the roller of cloth and the other parts, while it gradually moves the whole machine in its regular course. The action of this machine must be highly curious and amusing when viewed by a spectator from beneath, proceeding silently and steadily in its *lofty* calling.

APSDIN'S PATENT PORTLAND CEMENT, OR ARTIFICIAL STONE.

This is a patent lately granted to Mr. Apsdin, a mason, of Leeds, for an earthy preparation, which he calls Portland Cement. Its composition, that of equal parts of lime and aluminous earth, has been long known to the chemical world as forming a hard stony cement; a fact that ought to have been communicated to Mr. Apsdin by the person who assisted him in his specification, which would have saved him the useless expenditure of about £120. As it is, his exclusive privilege of manufacture can only extend to the peculiar process set forth in his specification, and we sincerely hope he may make a good profit by the undertaking.

The patentee directs that common lime stone is to be pulverized and then calcined in a furnace. A like quantity of clay is then to be mixed with the calcined lime stone in water, and made into a plastic paste. This composition is then to be dried, to be broken into lumps, and calcined again, until the carbonic acid has been driven off, when it is to be taken out of the furnace and reduced to powder. It is employed as a cement, or artificial stone, by mixing with the powder a sufficient quantity of water to make it into a paste, when it quickly solidifies into a hard substance.

The following account of a similar composition is extracted from a French work:—

Artificial Puzzolana.—M. Bruyere finds that an excellent artificial Puzzolana may be made by calcining, at a *red heat*, three parts of clay with one part of slacked lime by measure. M. de St. Leger, who makes the article for the sale, considers these proportions as the best.

SECURITY FROM EXPLOSION OF STEAM ENGINE BOILERS.

In consequence of an application on the part of the French government, the Royal Academy of Paris has drawn up a report on the

best measures to be adopted to prevent the bursting of steam engine boilers, and as a guard against their destructive effects to the surrounding buildings when ruptures do take place.

The Academy has directed that the strength of the boilers should be proved by employing the hydraulic press with a force five times greater than the pressure they would have to sustain in working the engines; a safety valve is to be affixed to the boiler and locked up, which is to be loaded so as to open at a pressure a little above that by which the boilers have been tried. The boiler is to be surrounded by a wall of masonry one metre (39.371 inches) in thickness; with a space between the wall and the boiler one metre in width, and the wall to be the distance of another metre from the surrounding buildings. M. Dupin has likewise proposed an additional precaution, which has been approved by the Academy, which is, to introduce *a metallic plug into the upper surface of the boilers, composed of such an alloy as will melt at a temperature a few degrees above that at which the engine is intended to work.**

This application rendered it necessary to form a table of the pressure and temperature of steam. The Academy consider the estimations already published as very uncertain, but have drawn up the following table up to eight atmospheres, which they believe to be nearly correct; further they could not proceed without making more experiments.

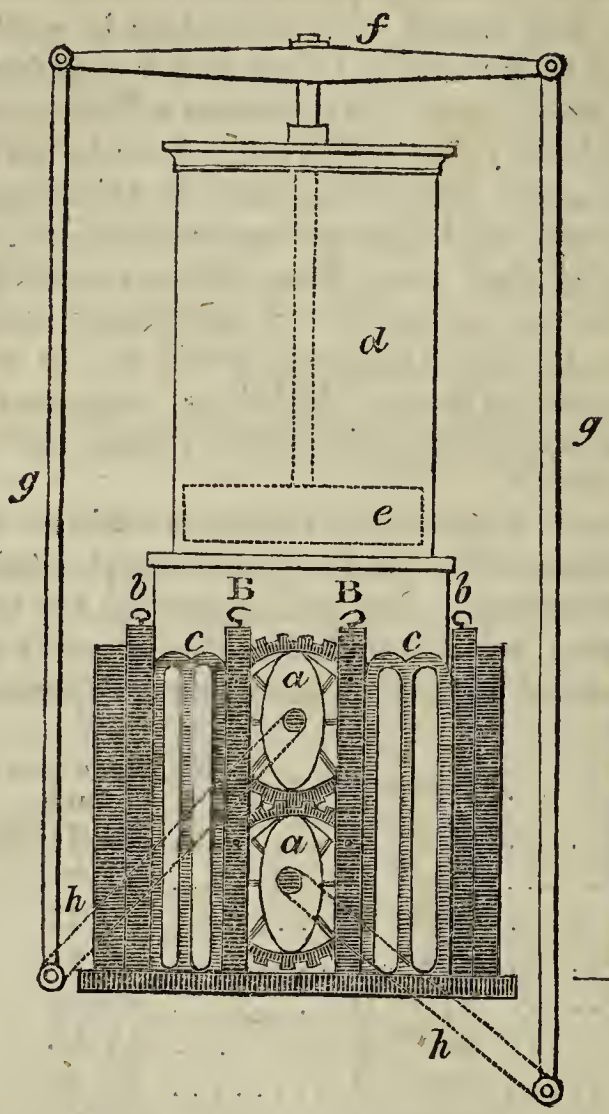
Elasticity in Atmospheres.	Height of Mercury.	Temperature.	Pressure on a square inch
1	29.92	212° 0	14.61 lbs. avoir.
1½	44.88	234° 0	21.92
2	59.84	250° 6	29.23
2½	74.80	264° 2	36.44
3	89.76	275° 0	43.84
3½	94.73	285° 3	51.15
4	119.69	293° 4	58.46
4½	134.65	302° 0	65.76
5	149.61	309° 2	73.07
5½	164.57	316° 4	80.37
6	179.53	322° 7	87.69
6½	194.49	328° 5	94.99
7	209.45	334° 4	102.30
7½	224.41	339° 3	109.60
8	239.37	343° 4	116.92

The Academy advise that no direction should be given for composition of the fusible plugs or plates, but that their preparation should be intrusted to a competent person, who should be made responsible for their accuracy in fusing at the given temperature. The upper surface of the boiler they consider to be the fittest place for them. The diameter and thickness of these they have not yet determined, but that they should be capable of withstanding the force

* We have placed the last-mentioned precaution in italics, considering it to be particularly deserving the attention of our Engineers.

of the steam without the risk of breaking; and that the plate when melted should leave an aperture sufficiently capacious for the rapid escape of the vapour.

Fig. 1.



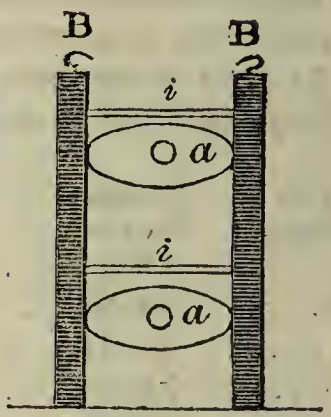


Fig. 2.

HALL'S PATENT OIL PRESS.

The specification of this Patent is of great length, and the drawings which accompany it are very numerous and complicated; as they comprise a full description of a connected series of machinery of the most complete kind, for the purpose of expressing oil from vegetable seeds,—thereby constituting what is termed an Oil-Mill of the first rate kind. The extensiveness of the apparatus, however, obliges us to select for our work such portions only as are of a novel nature, or that may be necessary to a comprehension of the subject.

The machinery generally employed for expressing oil from linseed, rape, and other oleaginous seeds, is of the stamping kind. The seeds are put into bags, and covered with envelopes, consisting of hair cloth and sheep skins sewn together; in this state they are subjected to pressure by the force of wedges that are continually being struck by perpendicular stampers, which are raised by the revolution of a cylinder, and fall by their own weight. The oil thus expressed

runs off and is conducted to a cistern; and the seed in the bag is reduced to a very hard solid cake, which is sold for the feeding of cattle, as it still contains a very considerable portion of highly nutritive matter.

Of late years the elastic force of steam has been introduced to give the necessary pressure, as a cheaper and more effective power, and the patented improvements by Mr. John Hall, jun. (of Dartford), which we have now to describe, consist in the peculiar method, or instruments, by which this power is applied.

a a, Fig. 1, are two elliptical iron cams firmly fixed on the horizontal shafts of two cog wheels, the teeth of which fit into one another and work together; B B *b b*, are massive iron plates between which the seed bags *c c*, in their envelopes, are placed; *d* is the steam cylinder, *e* the piston to the same, which when raised by the force of the steam from underneath, elevates the beam *f*, and the connecting rods *g g*; these being attached to the levers *h h*, turn the cams so as to press against the plates B B; which pressure is continued until the cams arrive with their longest diameters in an horizontal direction, as shewn by *Fig.* 2. By these means the oil is squeezed out, and is received into a proper receptacle underneath.

On the other side of the steam cylinder, another apparatus, similar in all respects to that shewn, is fixed, and moved by the same power; but in these the longest diameters of the cams are placed in a reverse direction, or at right angles with those in the engraving; so that when the utmost pressure is excited on one side of the cylinder by the ascent or descent of the piston, no pressure whatever is given on the other, and the bags may be removed to be emptied and replenished with a fresh quantity of seed.

The patentee does not lay a claim to the invention of cams for expressing oil seeds, these having been used before; but in a different manner, and less advantageous according to his opinion. Previously they were made to *revolve*, but Mr. Hall causes them to make a turn of only a quadrant of a circle, and then back again. The result of this mode of giving the pressure is stated in the specification to be, a much larger quantity of oil, and a much dryer cake, than has heretofore been obtained; we do not perceive how this effect is accounted for; possibly, it may be owing to the whole force of the stroke of the piston being expended in giving pressure upon a less extended surface.

The employment of elliptical cams is attended with a very great convenience, which we ought not to omit noticing. The two innermost plates B B are connected together by means of straps, as shewn at *i i*, *Fig.* 2, stretched out while the cams are exerting their pressure; when that pressure is relieved by the cams being turned into the position of these in *Fig.* 1, the connecting straps *i i* are raised, and the two plates B B are drawn towards one another; the bags are then perfectly free to be removed by the workman, to be filled again and replaced. And whilst this operation is going forward on one side of the steam cylinder, the pair of cams on the other side are exerting their whole pressure; these are next relieved while the pressure is

given on the side exhibited, and so on alternately, at every ascent or descent of the piston.

It is perhaps unnecessary to state, that the seed is usually heated, and thereby softened, previous to undergoing pressure, by which process more oil is obtained than when the seeds are pressed in their natural cold state. The oil obtained by the latter method is preferred for several purposes, and is known in commerce by the term "cold-drawn oil." Near to each pair of the cams Mr. Hall has constructed a steam apparatus, of an improved description, for heating the seeds, with convenient means for discharging the seed cake and refilling the bags.

The steam pressure upon the piston, employed by the patentee, is from 40 to 50 pounds upon the inch, nearly the whole of which, owing to the beautiful simplicity of the apparatus, is transferred to the end of the cams, where the power is increased according to the ratio of their surfaces, compared to that of the piston. The apparatus is of course made of sufficient strength to sustain the effects of a greater force than is brought into use.

PREPARATION OF DAMASKED STEEL.

M. Breant has been engaged in very numerous experiments on the production of steel of various qualities, particularly of the damask kind, similar to that of which the oriental blades are made; from which he concludes that the damask is not caused by the welding together of wire and rods of steel, and twisting them in various directions but by the employment of a cast steel more carburetted than the steels of Europe; which by slow cooling effects a separate crystallation of two distinct combinations of iron and carbon, essential to the production of the damask. If iron be united to so small a proportion of carbon as to be inadequate to convert the whole mass into steel, and it be very slowly cooled, the steel and the iron separate in some degree, and the metal properly managed will exhibit a white damask. When such a proportion of carbon is added as will convert the whole of the iron into steel, no appearance of separation will be exhibited. If more carbon be added, a mixture of two substances will be produced, the one steel, the other carburetted steel approximating to cast iron; by slow cooling these partially separate, and the mass assumes a damask, the pure steel appearing of a dark colour and the extra carburetted parts of a white.

The separation of these parts being proportionate to the time which elapses before the metal assumes the solid state, M. Breant, considers it as proper sometimes to avoid the fusing of such large masses as will take a long time in cooling; and he remarks that M. Tavernier in his travels in Persia, observed that the pieces of fused steel brought from Golconda when wrought are not larger than a roll.

The more carbon a steel contains, the difficulty of forging it is increased The greater part of those prepared by M. Breant could only be worked at medium temperatures; when at the white

heat, they fell to pieces under the hammer; at a red heat they are extremely hard and brittle, which was found to increase in proportion to the reduction of the temperature, and to that degree, that when tried with a graver or file they were found to be much harder and more brittle at a red heat than when cold.

M. Breant observed that one hundred parts of soft iron, and two of lamp black fused as quickly as common steel; and that the result was a compound from which excellent damask blades were made. The cementation of iron with carbon, he therefore considered as an unnecessary preliminary measure in the manufacture of steel. Another specimen of steel was produced by fusing one hundred parts of very grey cast iron in filings, with one hundred parts of the filings previously oxidated; which was found to be very elastic and to have a beautiful damask. From this result, M. Breant was convinced that good steel might be made on the large scale by fusing grey pig-iron in reverberatory furnaces, and adding to the melted metal a due portion of the same previously oxidated, or the native oxide of iron.

Notwithstanding the results obtained by Mr. Breant are unopposed to those of Messrs. Stodart and Faraday, yet he considers it likely they may have drawn erroneous conclusions, and attributed to the presence of metallic alloys, those effects which were produced by a greater proportion of carbon. It is therefore necessary to observe that every source of carbon was carefully excluded in their experiments.

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 22.—Optics.

(Continued from page 94, Vol. 2.)

Of Telescopes.

Besides the Telescopes described before, there is also one called a binocular, or double Telescope. This is no more than two equal Telescopes set in a frame, parrallel to one another; and these may be set at a proper distance from one another, by the help of screws; and that distance is to be the same as the distance of the two pupils of the eyes. When that is adjusted, a person is to look through them both at once; through one with each eye, to any object; which will then be seen by both eyes, and appear far brighter than through a single Telescope. Telescopes, in general, represent terrestial objects to be nearer, but not larger; and this nearness, vicinity, or seeming approach of the object, is as the magnifying power of the Telescope. Thus looking at a man one hundred yards off, with a Telescope that magnifies one hundred times, the man will appear to be no bigger, but will seem only to be a yard off; and the like of other objects situated on the earth.

The magnifying power of a Telescope will be found, if you make two equal circles of paper of an inch diameter or more, and fix one of them upon a ball one hundred, or two hundred yards distant; and

the other at a small distance, in a line with the first. Then look at the farther circle through the Telescope with one eye, and at the near circle with the other eye naked. Move the near circle (or else the Telescope) backward and forward, until the two circles appear equal, or coincide. Then measure the two distances, from the eye-glass of the Telescope to the two circles; divide the greater distance by the less, and you have the magnifying power of the Telescope.

There is no better way for trying the goodness of an object-glass than putting it in a tube, and trying it with several small eye-glasses, by looking at several distant objects, and particularly at the title page of a book; for that glass which represents objects the most bright and distinct, and bears the greatest aperture, and the shortest eye-glass, without colouring or dimness, is the best glass.

If several Telescopes of the same length be compared together, those are the best with which you can read the same print at the greatest distance.

And this may be a rule for those that buy Telescopes by which they may know how to choose the best.

[*To be continued.*]

LONDON MECHANICS' INSTITUTION.

On Wednesday evening, the 19th instant, at the close of a most interesting lecture on the Theory of the Winds, Dr. Birkbeck, the President, addressed the Assembly to the following effect:—"I am commissioned to lay before you a letter which has been received from Sir Francis Burdett, and which requires no comment; it is in close of a correspondence which has taken place between Mr. Francis Place, of Charing-cross, and the Honourable Baronet." The following letter was then read:—

(Copy) "*Kirby, Jan.* 16, 1825.

"Dear Sir,

"On my return home from a hunting excursion, I found your last, giving me all the information respecting the Mechanics' Institution necessary, and all the advice in your power; for both, my thanks. As however, it amounts to little, I must take my own way.

"The Institution, I consider as holding out the prospect of the greatest benefit to the people—the working people—of any that has been hit upon up to this time: I have it, therefore, much at heart; put me down for a Thousand Pounds.

"In haste, yours, very sincerely,

"*Mr. Place, Charing-cross, London.* "F. BURDETT."

It is quite impossible to describe the enthusiasm which this communication excited. It may likewise be noticed that the Baronet presented £100 to the Institution on a previous occasion.

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Vibration of Wires in the Air.—A Gentleman of Burkil near Basle, in Switzerland, is said to have observed, some years since, that a long wire stretched in the air gave musical tones in certain states of the weather. In consequence of this, and other observations, a kind of musical barometer is described as having been constructed by Captain Hans, of Basle, in 1787. Thirteen pieces of iron wire each 320 feet long, were extended from his summer-house to the outer court, crossing a garden; they were placed about two inches apart; the largest were two lines in diameter, the smallest only one, and the other about one and a half. They were on the side of the house, and made an angle of twenty or thirty degrees with the horizon. They were stretched and preserved tight by wheels for the purpose. During certain changes of the weather, these wires make a considerable noise, resembling that of a simmering tea-urn, an harmonicon, a distant bell, or an organ. It seems to be supposed that wires placed east and west yield no sound, and that to produce the effect they must be in the direction of the meridian. In the opinion of M. Dobriener, as stated in the Bulletin Technologique, this is an electro-magnetical phenomenon. *New Monthly Magazine.*

Casting of Ornamental Articles in Wood.—An abortive attempt was made some years since to fabricate an artificial wood, but it appears that our ingenious neighbours, the French, have succeeded in making very close imitations of the most beautiful woods, which they cast into a variety of elegant articles, forming a cheap and elegant substitute for the most costly carved work. They also cast the composition into large blocks, and saw it up into veneers. We expect shortly to see these articles introduced into London.

Natural Ice Caves. In a memoir on some natural ice-caves read by Professor Pictet to the Helvetic Society in 1822, that author advanced the singular fact which was attested by the neighbouring inhabitants, that ice is formed therein more in summer than in winter, and he accounted for this effect from two concomitant causes, viz. descending currents of air, and the cold produced by evaporation. One of the ice caves visited by Professor Pictet is situated near the summit of Mont Vergy, in Faucigny and is called Montarquis. To determine the fact of the absence of ice during the winter, two countrymen of the village of Sionzier, near the road to this ice cave, had the perseverance and courage to make three visits to the place during the autumn and winter, and having drawn up the following short account of their visits it was read before the society of Geneva.

"On the 22nd of October we ascended to the Ice cave of Montarquis with some difficulty, because of the first snow, and we found very little ice in columns; *it had begun to melt.*

On the 26th of November we re-ascended to the cave, we found very little ice at the bottom of the cave out of which there proceeded a kind of warmth.

On the 25th of December we re-ascended to the above-mentioned ice cave with great difficulty and trouble, and were almost carried

away by an avalanche. This circumstance discouraged us, but recovering from our fear we ascended to the spot. We found a moderate warmth in the cave and no ice; instead of which where there was ice in summer, there was actually water; in winter therefore it is warm in this cavern and in summer it is cold. The roof appears cavernous; it appears as if there were chimnies."

Alternate Advances and Recessions of the Sea.—It is a well-established fact that alterations in the level of the sea are constantly taking place in different parts of the world. The waters rise slowly and progressively higher by many feet, then gradually retire, and return again to their former level after a long period of years. Notwithstanding the numerous testimonies we have of this effect constantly taking place, some geologists have succeeded in causing it to be believed that the waters have been constantly declining in height, ever since a period when the highest mountains were covered by them. With a view to establish data for future comparison on this interesting subject, M. Brioneroni was at great pains in 1820 to select thirty different points in the Baltic sea, upon so many solid rocks, and thereon deeply to engrave and designate lines marking the level of that sea.

One of the most considerable inundations of the sea which have happened in this country was the overflowing of the estates of the Earl of Godwin in the reign of Henry I. which now forms that well-known bank, the Goodwin Sands.

One of the most remarkable instances of these alternate changes is to be found at Modena, in Italy, which seems to leave no question as to the fact. At that city and about four miles round it, wherever the soil is dug into, when the workmen arrive at the depth of sixty-three feet they come to a bed of chalk, which they bore with an auger five feet deep; they then withdraw from the pit before the auger is removed, and upon its extraction the water bursts up through the aperture with great violence, and quickly fills this new made well which continues full, and is effected by neither rains nor draughts. In the sinking of these wells, the workmen uniformly find at the depth of fourteen feet the ruins of an ancient city; paved streets, houses, &c. Under this is found a very solid earth; lower down a soft oozy earth chiefly of vegetable matter; at twenty-six feet deep are found large trees entire, such as walnut trees, with the walnuts still sticking on the stem, and their leaves and branches in exact preservation; at twenty-eight feet deep, a bed eleven feet thick of chalk, mixed with a vast quantity of shells. Under this again are found trees and vegetables as before; and alternately chalk and vegetable earth until they arrive to water at the depth of sixty-three feet. These are the layers wherever the workmen attempt to bore; and in many of them are found charcoal, bones, and pieces of iron. It would thus appear that this country has been alternately overflowed and deserted by the sea, one age after another: nor were these overflowings of trifling depth or of short continuance. When the sea burst in, it must have been a long time in overwhelming the branches of the fallen forest with its sediments, and still longer in forming a regular bed of shells over

them of eleven feet in thickness. It is supposed that an age was occupied in forming one of these layers, and consequently many ages in the production of them all. It should be considered, that on the waters retiring, the land must have had time to grow compact, to gather fresh fertility, and to be drained of its waters, before it could be disposed to vegetation, or before its trees could have arrived at maturity.

The instances are almost innumerable, of ancient towns and cities that are now covered by the ocean,—would it not therefore be a wise and humane measure of legislation to prohibit the building of towns and cities in situations liable to these awful visitations ?

Detection of Arsenic as a Poison.—Dr. Robert Christison has lately published in the Edinburgh Medical Journal the result of a series of elaborate experiments, by which he has established some simple and unerring tests, by which one quarter of a grain of arsenic, if dissolved in as much as 8000 parts of either broth, tea, coffee, with cream and sugar, porter, wine, &c. and taken into the stomach, and there mixed with the animal fluids, may be detected. A stream of sulphuretted hydrogen gas is to be thrown up through the suspected matter (previously diluted and prepared according to directions which he has given) causes an effective separation of the arsenic. The matter thus precipitated is then to be dried, black flux added, and as much of the mixture inserted into a small glass tube so as to fill not more than half an inch of the lower closed end, which is then to be heated over a spirit lamp. If any Arsenic be present, it will immediately be seen lining the upper part of the tube, with a metallic steel-like film or crust, the characters of which are minutely described.

Preservation of Fish during Carriage.—For ensuring the freshness of fish conveyed by land carriage, it is recommended that the fish should be opened, and the internal parts sprinkled with powdered charcoal *(New Monthly Magazine.)* The dirty *appearance* this will give to the fish, will we think, prevent its ready adoption by the fishmongers.

The Light of the Moon and Planets is considered by Professor Leslie to be caused by phosphorescent matter, and not by mere reflection from the Sun. The light falling from the Sun upon the Moon's surface appears to him to be almost entirely absorbed, and exerts there a power to cause the projection of a still greater quantity of luminous particles, which had previously lain combined with the substance, which he supposes bears a resemblance to the sulphate of barytes.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

COPPER PLATE PRINTERS' INK.—To the person who shall invent and discover to the Society the best composition for printers' ink, superior to any hitherto known or in use, and fit for the finest kind of copper-plate printing.—The Gold Medal, or Thirty Guineas.

PRESERVING SALTED PROVISIONS.—To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from becoming rancid or rusty.—The Gold Medal, or Thirty Guineas.

SUBSTITUTE FOR WHITE LEAD PAINT.—To the person who shall produce to the Society, the best substitute, superior to any hitherto known, for the basis of white paint, equally proper for the purpose as the white lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white lead.—The Gold Medal, or One Hundred Guineas.

RECENT PATENTS.

SHIP'S TACKLE.—To William Burnett, Esq. of New London Street, London, for certain improvements therein.—Sealed 25th November. Six months.

SUBSTITUTE FOR LEATHER.—To Thomas Hancock, of Goswell Mews, Goswell Street, London, for a method of making an article as a substitute for leather, &c.—Sealed 29th November. Six months.

AIR CHAMBER.—To Robert Dickenson, Esq. of Park Street, Southwark, for an improved air-chamber for various purposes,—Sealed 1st December. Six months.

WATER WHEELS.—To William Moult, of Lambeth, Surry, engineer, for an improvement in the working of water wheels. Sealed 9th December. Six months.

GAS METER,—To Sir William Congreve, of Cecil Street, Strand, London, for an improved gas meter.—Sealed 14th December. Six months.

LOCOMOTIVE CARRIAGE.—To David Gordon, Esq. of Basinghall Street, London, for his invention of certain improvements in the construction of carriages, and other machines, to be moved or propelled by mechanical means. Sealed 18th December. Six months.

TO OUR READERS AND CORRESPONDENTS.

We thank Medicus for his very able and interesting paper, but we regret the inadmissibility of such a subject in the Register. We should be happy to insert an account of the instrument he describes, if he would favour us with a sketch of it.

Adolescens's favours were received too late to get an engraving executed for the present number. That on Balloons we hope to make room for in our next.

We inserted Alcohol's Communications in our last Number from a desire of acting fairly towards him, but conceiving it necessary to submit our objections thereto, to the consideration of our readers, at the same time that we gave the description of the invention (as some apology for the introduction of the most ill-digested contrivance our little Work contains) we have unintentionally given offence to Alcohol, who has discharged a retort against us filled with a very acrid alcoholic vapour. He laments most pathetically over our barbarian ignorance of his philosophy, and concludes by saying—

"The idea you have advanced of a vacuum being produced in the cask, fatal to it, when the air can find its way through the pores of the wood (quicksilver will do this) is too unphilosophical to make it necessary I should attend to any of the other strictures, which are contained in your critical remarks."

It is somewhat cruel in Alcohol to touch us in so tender a place as our deficiency in philosophical knowledge—but Alcohol should consider we have never professed ourselves as wholesale dealers in philosophical matters—but mere retailers of matter of fact. We certainly dare not enter the lists against an etherial spirit—and will leave the argument in his hands after asking him a single question. Would Alcohol, when he sends his footman, (of whose indolence he complains) to draw some beer, and John returned an hour or two afterwards to tell his master that no beer would run out of the *ventless cask*, would Alcohol send him back again, reproving him for his mistaken "unphilosophical idea," and tell him to wait until "the air had found its way through the pores of the wood?"

[*To be continued every* Fortnight.]

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REGISTER

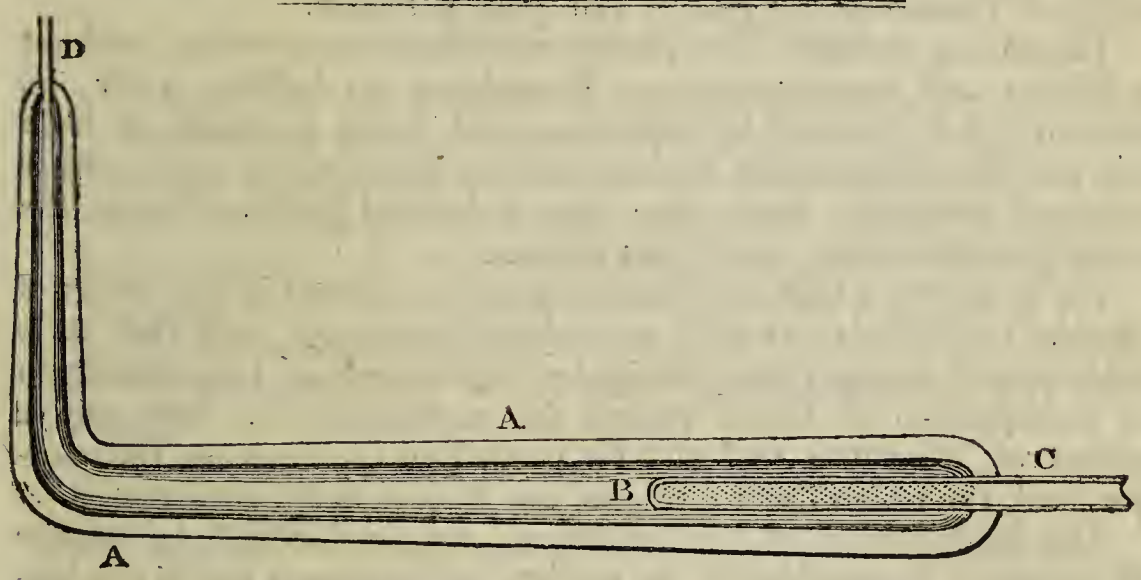
OF

THE ARTS AND SCIENCES.

No. 36.] SATURDAY, FEBRUARY 5, 1825. [Price 3*d*.

CONTENTS:

Curdy's patent Steam Chambers 177
Russell's Patent Iron Gas Tubes 178
Artificial Warmth 179
Prevention of Accidents from Fire Damp ..... *ib.*
On the proposed Iron Railways. 182
Improvements in Balloons..... 184
Patent Machine for splitting Skins 185
Patent Razors and Strops..... 187
Circular Chimney Flues..... 188
Miscellaneous—Bleaching of Sponge, 188,—Preservation of Birds, 189,—Do. of Red Cabbage Colour, *ib.*—Use of Elderberries as a Chemical Test, *ib.*—Mr. Owen's Calculations on Machinery, *ib.*,—Motion of the Electric Fluid, *ib.*—Light produced by Crystallization, 190—New Piece of Artillery, *ib.*—Temperature of the Sun, *ib.*—Flowers in Winter, 191—Buckinghamshire Lace, *ib.*—Erlanite, a new Mineral, *ib.*—Distillation of Wines with Milk, *ib.*—Patents, Correspondents, &c. 192.



MR. CURDY'S, NEW PATENT STEAM CHAMBERS,

(RECENTLY EMPLOYED IN THE IMPROVED AMERICAN STEAM ENGINES.)

The success which has uniformly attended this novel and improved method of generating steam in the United States of America, for the propelling of vessels upon water as well as for other purposes, has induced the above-mentioned scientific gentleman from that country, to introduce so valuable an acquisition to our mechanical operations; and to secure by Letters Patent to himself and partners, the advantages which cannot fail to result therefrom.

It is found that one of the Patent Steam-chambers eleven feet long, six inches diameter at the large end, and tapering gradually to three inches at the small end, is capable of generating as much steam as a boiler containing 150 cubic feet.

The preceding engraved figure exhibits a section of a steam chamber, A A, made of wrought iron, and constructed with an elbow. Into the large extremity is inserted the "injection barrel," or tube B, closed at the inner end, and perforated with small holes in every

part; and is connected to a forcing pump by the pipe C; D represents the tube through which the steam passes to the engine. The steam chamber is placed in a furnace, and when heated, the water is forced by means of the pump through the injection barrel, by which it is distributed in fine spray over the interior surface of the heated chamber, which instantaneously converts it into steam of any required pressure. To increase the power it is only necessary to encrease the number of the steam chambers, each of which is constructed in a similar manner and supplied by means of a distinct pump: each chamber with less than a cubic inch of water injected at every stroke of the pump, is considered adequate to supply steam for an engine of four horse power. We understand that they have been exhibited in operation to some of the most scientific engineers in these kingdoms, who have expressed their decided approval of the invention.

Two small chambers only six feet long and six inches in diameter, have been applied to an ordinary four horse engine in a barge, seventy feet long; by the employment of which it was propelled on the River Thames at the rate of ten miles per hour.

The steam chamber is a perfect substitute for a boiler, without its defects and inconveniences. Containing no boiling water, no personal risk is incurred by explosion; and being so small in bulk their peculiar applicability to loco-motive engines and many other important purposes, must give them a decided preference over the ordinary cumbersome, prodigious boilers.

We understand that the Patent-rights are vested in the hands of powerful individuals, as well as eminent engineers, and that it is contemplated to apply the principal of the invention immediately in the construction of steam vessels for navigation; for loco-motive engines on railways; and also for propelling carriages on the common road, for which latter purpose, one is now being constructed.

The introduction of this invention, we are inclined to believe will hereafter be considered, as making an important era in the history of the steam engine.

RUSSELL'S PATENT IRON GAS TUBES.

Mr. James Russell, of Wednesbury, near Birmingham, who has justly acquired much celebrity for the manufacturing of wrought-iron tubes, cylinders, &c. which require a superior execution of the welding process, has recently obtained a patent for his method of making wrought-iron gas tubes or pipes.

Rolled iron in plates of a suitable length and thickness, is first cut into strips of the breadth required to form the circumference of the tube to be made. The sides of the strips are then bent round by swages in the customary way, so as to bring the opposite edges closely upon one another. He next introduces the tubes so prepared into a blast furnace, wherein they are exposed to a heat just insufficient to fuse them; in this state they are placed under the operation of a tilt hammer, to complete the welding of the seam or

joint. The face of the hammer, as well as that of the anvil, have semi-cylindrical grooves, corresponding with the size and shape of the tube under manufacture; and between these the tube is gradually passed along, receiving in its progress a rapid succession of blows from the hammer. When the welding is thus completed, the tubes are in a rough imperfect state; they are therefore again heated in the furnace, and passed between large rollers which have grooves of various diameters, through those of the right dimensions which give to the tubes a smooth exterior surface; and as they emerge from the pressure so given, a smooth internal surface is given to them by their passing over a stationary round rod of the proper size of the bore of the tubes; the rod having a conically pointed end, enters the tube as they are delivered from the grasp of the rollers; while the rollers force them over the rod (or core as it is termed), and thus the interior as well as the exterior, are brought to a true cylindrical figure.

ARTIFICIAL WARMTH.*

To those who have experienced (and who have not!) the *miseries* of a comfortable fireside, and the consequences upon health, mind, and temper arising from the present system of open Fires, we would particularly recommend this well written and clever pamphlet, although addressed to the consideration of persons *generally*; the subject and the observations are strictly mechanical, and if we could have wished that the contrivance proposed by the author were more detailed and amplified, we do not the less recommend it to general perusal.

Mr. Boyce goes back to the earliest ages of society to mark the progress, little as it has been, which artificial warmth has made; "the want" says he, "of Artificial Warmth must have been early felt by man, and the art of procuring it may perhaps claim an antiquity beyond the age of architecture. The half-clad savage of the colder regions, employed all day in the chase, found, at night, the blazing fire necessary to his very existence; and it was to protect this preserver from the vicissitudes and inclemency of a northern sky, that at a future period, he surrounded it with walls and a roof, and thus became an Architect."

The author appears to be perfectly sensible of the prejudices which must be overcome before a better system can be introduced, and combats with much ingenuity the feelings associated with the thought of "an Englishman's fireside."

"There are many, in the aggregate of fireside society, whose partialities and dislikes deserve to be treated with respect; but by whom the proposal of a new system of affording warmth, will not at first be very eagerly received. Men of social and domestic habits,

* Remarks on the different Systems of warming and ventilating Buildings, &c, with Reference to an improved and simplified calorific Apparatus, by G. P. Boyce.—Second Edition.

are accustomed in winter evenings, after the hours spent in attention to the perplexing concerns and affairs of life, to meet their families and friends, perhaps for the first time in the day, assembled in a circle at the fireside: at such moments when care sleeps, and, to the cheerful mind, every thing appears delightful, no wonder the fire occupies a considerable share of attention; and hence it is, that at last, from long association, they confound the sources of enjoyment, and learn to attribute to the fire itself, pleasures, in whose production it had but little share. A domestic winter evening is indeed a delightful picture; but that the whole spirit of the scene depends on the presence of a brisk fire, is a degrading and mechanical position, to which we cannot assent. It is the effect of association. Do we regret the absence of fire in summer evenings, when the source of warmth is not so obviously perceptible? And, surely, it is not to be said, that happiness is more difficult of attainment at that season, than when offering up the sacrifice of our health before the smoke-giving idol. Moderate and cheerful warmth, in the absence of mental care, is all that is necessary; and if that be produced, no matter how imperceptibly, it is not be doubted the current of an Englishman's feelings will flow as happily as before."

After attacking with much humour (*good* humour!) and in a strain of pleasant satire the effects produced by open fires, the alternations of torrid heat and frigid cold: the variations of the thermometer when exposed to the blistering heat of the cheek before the fire, and to the back towards the door equalling in temperature a very iceberg; the blazing scarlet of a contiguous face and "some incipient tints of red, blue, and indigo, overspreading in prismatic regularity the nasal feature of a pale looking gentleman seated nearest the door;" he proceeds to state the first principles of chemical science in relation to artificial warmth.

"Caloric, or the matter of heat, exists in all bodies, and may be disengaged or made sensible by various means. For general purposes, the most usual is by the process of combustion. To support this process, a continual supply of oxygen or vital air is indispensable, which is procured from the surrounding atmosphere, wherein it exists, as a component part, in the proportion of twenty-one per cent. the remaining seventy-nine parts being nitrogen, a principle not only unfit for combustion, but possessing the property of instantly extinguishing flame, as well as animal life. All bodies are expanded by heat; gaseous fluids most especially so. Atmospheric air, therefore, upon receiving any additional degree of warmth immediately becomes proportionately rarefied, and ascends, if unimpeded, either till it has lost its superabundant caloric, by interchange with the general body or till it meets with a stratum of the same temperature and levity. Now if we consider the action of these principles for a moment, it will be evident that, in seeking to obtain warmth from an open fire, the party seeking, is placed exactly at the *wrong end* of the apparatus. The only illustrative case at present occurring to the writer, and of which the aptness must apologize for the homeliness, is that of a person who, desirous of obtaining flour

or meal, should yet expect to receive it by placing himself at the hopper or receptacle of the corn, before it has passed between the mill-stones. It is evident he is situated at the source of supply, and not of the produce: the raw material is rushing from him, instead of his receiving that which has undergone the beneficial process. The cases are perfectly parellel:—the fire, or combustion in the grate, is continually drawing to itself fresh supplies of atmospheric air, from all corners of the apartment; and consequently the radiation of heat in those directions is completely checked and overcome by the superior force of the cold current; whilst, fast as the supply undergoes the calorific process, it becomes rarefied, ascends, and is wasted through the obvious channel of the chimney.

"Some very considerable improvements in the form and construction of the apparatus for supplying Warm Air, have been made by the author. It is usually placed on the basement floor, and may be fixed either within or without the building, being provided with a flue, to carry away the smoke arising from the fuel consumed in it. Around it a chamber or hollow space is then built, leaving a small channel open at the base, through which the atmospheric air enters, becomes warmed and rarefied, and is admitted at pleasure into the different apartments, by valves which regulate the supply. Nothing can be more simple, or less liable to deranged by time or accident. The space occupied never exceeds a square yard, and it is generally fixed in a few days, with little trouble or inconvenience. To obviate any apprehensions that might be entertained from air heated by a metalic body, the author has succeeded in a method of constructing his apparatus, so that the air is heated by passing over a surface of pure porcelain, or earthenware, and, by a small addition, may also be rendered available to the fumigation of apartments, and the air supplied be impregnated with the requisite degree of moisture or perfume.—Any kind of fuel may be used; and, from the rapidity of the draught, the flue never requires cleansing, which alone is no inconsiderable exemption from trouble and expense. The current of air thus supplied may be at any temperature above the common atmosphere most agreeable to the feelings; and it is almost unnecessary to state, that upon being analyzed, air moderately heated, has always been found to contain the same due portions of its constituent parts as when at the common temperature."

[*To be continued.*]

ON THE PREVENTION, AND THE CAUSE OF THE EXPLOSION OF FIRE DAMP IN COAL-MINES, BY MR. THOMAS BAKEWELL.*

The means of safety which I wish to recommend, arises from hydrogen gas being lighter than atmospheric air, and in all fluids that

* Of Spring Vale, near Stone, in Staffordshire.

do not spontaneously unite, it is the property of the heavier to sink under the lighter. If I pour oil into a vessel, it sinks to the bottom, displacing the air in it, because heavier than the air; but if I pour water upon the oil, it will sink to the bottom, and displace the oil: so in all places, in mines, and every where else, atmospheric air will displace hydrogen gas, if the gas has liberty to rise by having an open space above it, so as to give it a free passage; and I cannot think it possible for the gas to accumulate so as to explode in any part of a coal-mine from the roof of which there is an acclivity towards the main shaft, or other passage, directly upwards, communicating with the atmosphere above. But the shafts of coal-mines are generally placed upon the deep of the strata, and the works go upwards and form chambers, the roofs of which are higher than the entrances to them; and in these the gas accumulates, and no current of air below will entirely clear them, and no place in a coal-mine can be safe, from which the air has not free egress, without descending; and in these chambers, from which it cannot escape, it is so pressed by the atmospheric air under it, as to become explosive, which it is not without pressure. If the strata of the coal rises but a little, safety may be obtained by taking down the roof, so as to leave an acclivity towards the main shaft from the place of working. In this way a mine in this neighbourhood has been kept free of danger for upwards of twenty years, while in all the others accidents have occurred. Where this is not practical, an air-pump might be used. There has for some time been an air-pump in use in the Marquis of Stafford's coal-works near this place, of a simple construction, and kept in motion by the engine which draws the coal; the pipes of the air-pump terminating at the highest part of the roof where the works are carried on. It would be preposterous to contend that Davy's lamps will always procure safety where the mine is highly charged with gas, and it may be a question whether more lives have not been lost in coal-mines since they were in use than before; but if I understand them right, they might be made an excellent means of consuming the gas where it cannot be expelled. If large ones were left in use, near the roof of the highest part in the absence of the work-people, it might prevent any dangerous accumulation of the gas. There is, however, no absolute safety, but by completely getting rid of the cause of the danger.

THE IRON RAILWAY COMPANIES.

The following sensible observations upon the rail-road Mania that at present prevails, we extract from a Letter which appeared in the Times Newspaper of Monday last.

"It is very evident that many of the prospectusses have been drawn up by persons very little acquainted with rail-roads. They propose travelling on them, by means of locomotive engines, at the rate of ten, fifteen, and even twenty miles an hour. There is no instance at present of their going at the rate of even six miles an hour: the

perfection they may attain at any future period is problematical, and therefore should not be calculated on as data for present operations. We can only be guided by what has already been done—not by the supposition of what may be done hereafter. The present locomotive engines are of an enormous weight: the one at Killingworth colliery is eight tons. Such an immense weight, going at so great a speed, would shatter both rail-road and engine to pieces; besides which, the carriage would be in great danger of running off the rails, and then let me ask what power it will require to get it on again? the expense of keeping the present rail-roads in repair is very heavy, and must be equal to that of a canal: a pebble frequently occasions the breaking of a plate, which must be replaced by a new one, and constant use wears the plates out. Canals are sometimes impassable from severe frost, floods, and a want of water; but are not rail-roads subject to impediments from snow and frost also.* Does not a severe winter, in some degree, affect rail-roads, and throw them out of order by a subsequent thaw, the same as it affects the paved streets in London, which are full of holes after a severe winter, and require to be fresh laid? that this must be the effect in a greater or lesser degree, any one may notice, by looking at the stones in a gravel walk after a frost.

On reading these remarks, you will, perhaps, be surprised to find I am an advocate for rail-roads; but my object in writing is to draw the public attention to the subject, and of leading them to think, before they pursue too far many of the present projects. I have no doubt but England will, in time, be intersected with rail-roads, and that great benefit will result to the community from them; and that the same vast advantages will be derived by the country as have already arisen by the cutting of canals; but in order to make them answer to capitalists, they must be laid down in judicious situations, and this is my leading object in writing on the subject. I have said, that if laid down in opposition to a canal, they will not answer: but I am firmly of opinion, that if laid down from a mine, or colliery, or a quarry, to a navigation; from a navigation to a principal town, or in a situation required, where no navigation or rail-road exists, they must answer; and I hope my observations are so far founded on common sense as to induce you to insert them in your valuable paper for the good of the public, and that they will tend to prevent that general delusion which seems to exist in the minds of so many; and that monied men will be led to discriminate between the good projects and the bad, before they venture to embark such large sums, by deliberating with their own cool judgment.

The projected plan from Manchester to Liverpool I highly approve of: it is much wanted. The traffic by land-carriage is immense, and the canals cannot convey all the goods; from the quantities which are constantly passing, they are often choked up with

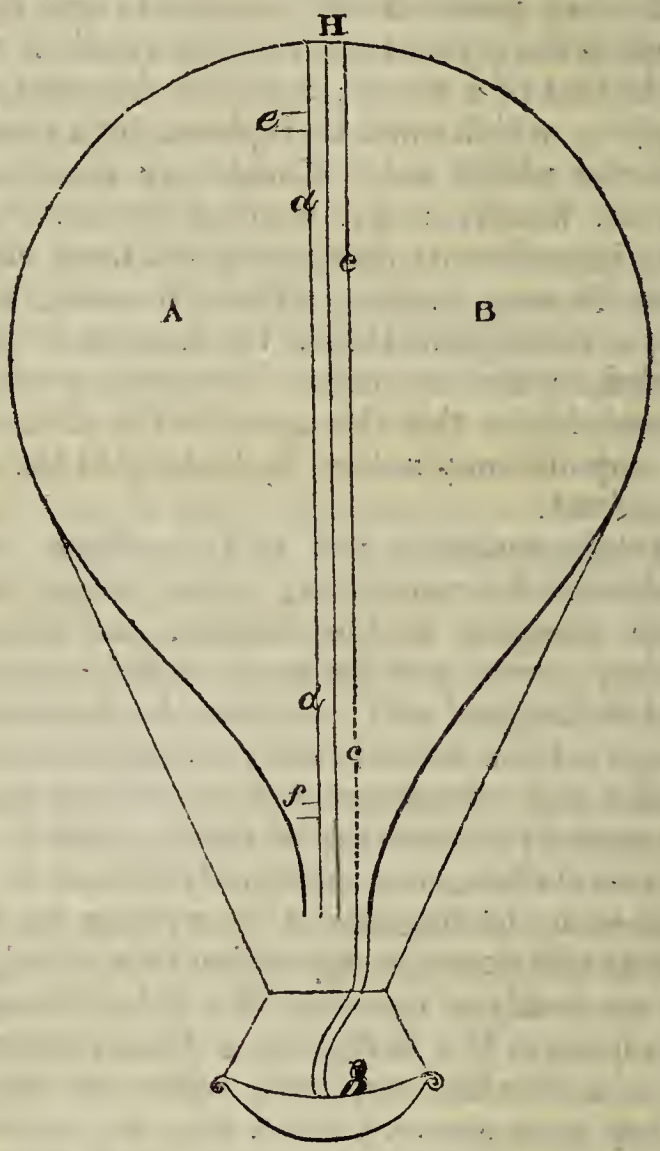
* Rail-roads upon the *ordinary* construction certainly are subject to these impediments of frost and snow, but Mr. Palmer's Patent Railway is entirely free from this serious defect, as will appear upon reference to our descriptions of the invention in Nos. 7 and 8 of this work.

barges: therefore a rail-road in such a district, and in many other situations such as I have pointed out, must answer: whereas it appears utterly impossible that others can pay even a trifling dividend.

I am, Sir, your obedient servant,

London, Jan. 22, 1825. A. B. C.

IMPROVEMENTS IN BALLOONS.



"*To the Editor of the Register of the Arts and Sciences, &c.*

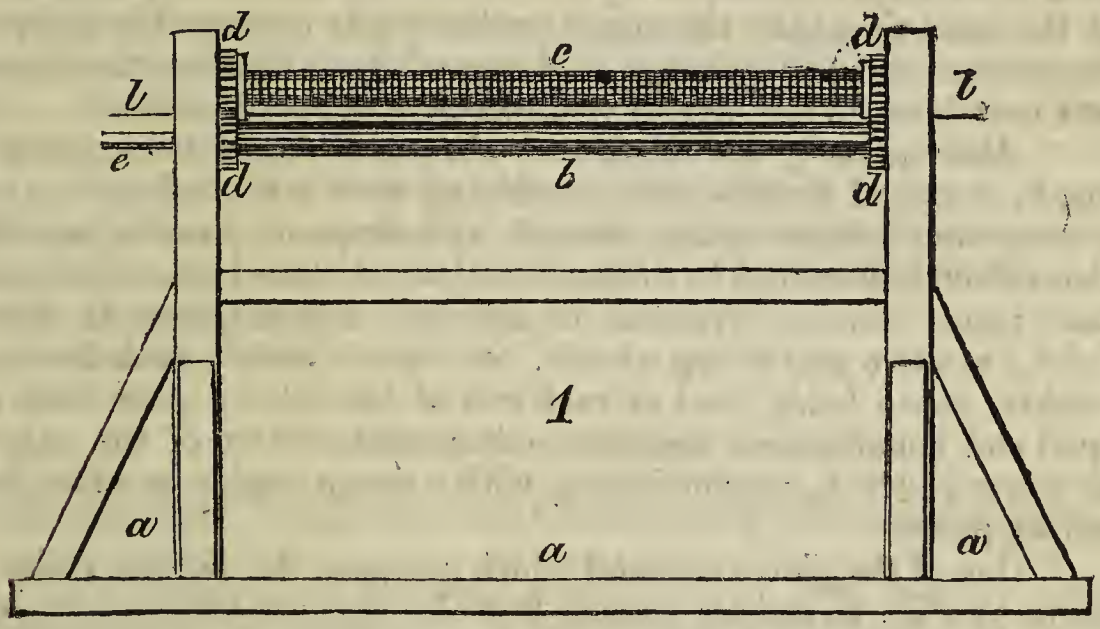
"Sir,

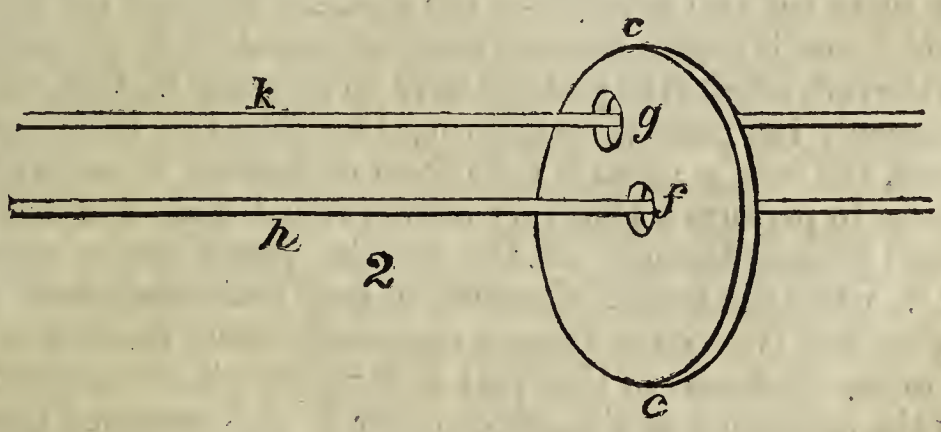
"As Balloons have recently become an object of popular attraction, I venture to communicate to you a plan for raising or lowering them without the aid of ballast, or the letting out of the gas; which I propose to effect by the injection of atmospheric air, in the manner following.

"The balloon is divided into two parts, *a* and *b*, by a partition of silk; precisely in the centre are two tubes, *d d* and *c c*, the valve *e* opening outwards, and *f* opening inwards form a communication between *b* and *d*, two similar valves form a communication between *a* and *d*, but are hid by the pipe *c*. When the balloon is to ascend, instead of loading the car with ballast, let a sufficient quantity of air

be injected through the pipe *c*, this will drive the gas displaced through the pipe *d* into *b*, by means of the valve at bottom; and thus condense it equally all over the balloon. Should the aeronaut wish his balloon to rise higher in the air, he has only to remove the tube *c* and the air will fall out, (if I may use such an expression), because the air below with which the balloon had been partly filled is heavier than the air above; and the elasticity of the gas will hinder more coming in. Should he wish to descend, he will re-inject air as at first; and if he again wishes to ascend he must first pump sufficient air into *c c* to drive the gas into *a*, by means of the valve *i*, then pull the valve *h* and the elasticity of the gas will drive out the air through the escape holes at the bottom of *c*; if the aeronaut should be pressed for time he need only pull the valve *h*. The two partitions of the balloon had better have separate valves. The valves *e*, *f*, and their corresponding ones, need not have any strings.

"ADOLESCENS."





PATENT MACHINE FOR SPLITTING SKINS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"THE art of splitting a raw hide or sheep-skin into two parts is, I believe, very little known beyond the circle of those who are immediately concerned in the leather manufacture; I have there-

fore thought that a brief account of the process would not be undeserving of a place in your work, already pre-eminent for a choice selection of the most ingenious, and valuable mechanical inventions.

" It is perhaps necessary to premise, that after a sheep-skin, or other raw hide, has been cleansed and purified from all those matters which are extraneous in the preparation of leather, it undergoes a scraping and paring of its inner surface, to give it a thinner or more uniform substance; by which also the processes of tanning and dying are facilitated. This reduction of the substance was once entirely, and is now partially, executed by means of a knife in the hands of a dextrous workman; whose utmost skill was however insufficient to prevent the frequent recurrence of unlucky cuts by which the value of the skin was considerably lessened;—and the pieces sliced or scraped off were only applicable to the making of glue. By the introduction of machinery to effect this operation, the skin is now divided throughout its entire substance into two parts of equal extent, both of which are subsequently converted into leather or parchment; at the same time that the upper (or hair) side of the skin is by its smoothness and uniformity of thickness of greater value; the important usefulness of the invention is therefore unquestionable.

" *Description of the Machine.* *a a a* is a strong frame-work of wood; *b* a solid wooden roller revolving upon a central shaft; *c* is a compound flexible roller, formed by a series of circular metallic plates about half an inch in thickness and about three inches diameter; these plates have an irregular or eccentric motion given to them. *d d d d* are two pair of cog wheels, the teeth of which work into one another, these being fixed at each end of the rollers gives them an equal and simultaneous motion. *e* is a continuation of the axis of the lower roller *b*, communicating with a steam engine or other first moving power.

" One of the plates of metal which compose the flexible roller is shewn by *Fig.* 2. and the manner in which they are made to revolve. Each plate has two holes;— a rod *h* passes through the central hole *f*, which rod is fixed; the hole being of considerably greater diameter than the rod, admits the plate to have an irregular motion, and to play thereupon; the plate is turned round by means of the rod *k* passing through the hole *g*; and it is so fixed to flanches at the ends of the roller as to perform a planetary motion round their common centre; this rod passing through all the circular plates carries them round with it, while the centre of motion of each individual plate, owing to the play that is given to them is constantly being changed in proportion to the thickness of that part of the skin which is pressed against it by the revolution of the lower roller *b*: *l* is intended to shew the situation of the edge of the knife, between the upper and lower roller, almost touching them at the point of contact; (or as I believe it is termed, *at the angle of pressure*:) an horizontal, sawing-like motion is given to this knife by the action of a crank, which operates at the same time as the skin is being passed between the rollers, and severs it into two parts as it emerges from its pressure. The parts necessary to produce the several motions described I have not drawn

for these reasons ; being well known and understood by all mechanists and to the majority of your readers, their delineation would give an apparent complexity to a very simple and beautiful machine, and be attended with an unnecessary expence in the engraving.*

" The circular plates of metal are all made of one size and weight ; the sides are turned to smooth planes, their peripheries to a true and uniform figure, and not being pressed fast laterally, but kept slack and oiled, their sides slide against one another, and each individual plate presses simply by its own gravity, so that however varied the thickness of the skin may be that is operated upon, the quantum of pressure is alike over all parts of its surface.

" The skins are passed through the machine in the wet state ; a man stands on the side shewn, and taking up one, spreads out the upper end of it smoothly over the roller *b*, it is quickly taken hold of by the rollers in their progress, and as it passes through, the workman continues to spread it out with his hands to preveut the doubling of any part.

" As a curiosity, and to shew the power of the machine, it is not unusual to split in this manner a sheep-skin into three equal parts ; the outside one is applicable in the preparation of several descriptions of leather, the middle to the making of parchment, and that on the flesh side from its extreme inequality in thickness is not sufficiently firm to be applied to any other purpose but that of making glue.

" CORDOVAN."

" *Leather Lane,*
" *Jan.* 20, 1825."

THE PATENT USEFUL AND ELEGANT FACILITATOR.

This delectable title has been given alike by the patentee (Mr. Thomas Ryalls, of Sheffield), to two distinct inventions, the object of both being, however, the *facilitating* of the operation of shaving. The first consists simply, in the addition of a metal slide to the back of a razor, which when held in the hand presses the sides of the handle together, and fixes the joint more firmly. The second is in an " improved" strop, made in the following manner. A strip of buff leather is rubbed over with a composition made with oil and virgin's wax, and afterwards hammered upon an anvil which closes the pores, and gives it a firm, even, and smooth surface. It is then glued upon one side of a piece of wood and a strip of woollen cloth upon the other, for the purpose of cleaning the blade of the razor prior to stropping it ; and for keeping the strop itself clean, it is furnished with a cover made of horn, which is turned over it (in the usual manner) by means of a pivot at the end

" The useful elegant Facilitators" are " warranted *never* to get the worse for wear."

* We thank our Correspondent for his very judicious consideration.

PROPOSED IMPROVEMENT IN THE CONSTRUCTION OF CHIMNEY FLUES,

To prevent the Use of Climbing Boys;
With the Cure of Smokey Houses as the Result of this Improvement.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"Nothing can be more barbarous than to force a human being into such a situation where a dog or a cat would howl until delivered from it. The idea of suffocation, together with the filth and degradation of the occupation, are quite reason enough for the employment of Machines to prevent the use of climbing boys; and although the public are much indebted to the inventors, the adaptation of a brush to a square flue must always be very imperfect, or indeed almost impossible to be rendered effectual for cleaning the corners or angles.

"To remedy this, I would have all chimnies henceforward built with circular coves inside, made of stone or pottery, in cylindrical pieces, with the elbows and turnings upon the same principle. Thus you would have an adaptation to a brush which might be made in the form of a perfect ball.

"The result of this alteration would, in all probability, be a considerable prevention of smoky houses, as a circular flue is generally understood to draw better than one of any other form, which is perhaps owing to the air having a natural tendency to a centrical movement.

"I. H."

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Bleaching of Sponge.—The sponges are to be first soaked in cold water for several days, and frequently squeezed out until the water ceases to be discoloured by them. The water is found to dissolve muriates, sulphates, and a brown animal matter insoluble in Alcohol. They are next to be washed in hot water, which separates the hydriodate of potash, and it is observed that if this washing water be concentrated and moistened with strong sulphuric acid, it will render paper which has imbibed a solution of starch of a blue, proving thereby the presence of iodine in sponges without burning them. When calcarious concretions are containcd in the sponges they are removed by soaking them for twenty-four hours in a mixture composed of one part muriatic acid to thirty of water. Being washed again, they are to be put into a solution of sulphurous acid of specific gravity 1034, and left therein for eight days, occasionally squeezing them. When they are thus well bleached, they are to be washed again in much water moistened with orange flower water, and dried slowly in the air.

Chlorine so commonly used in bleaching is found rather to increase than diminish the colour of sponge; and sulphurous vapours are found to have a very feeble action upon it.—*Journal de Pharmacie.*

Preserving of Birds.—M. Tremmick, director at the Dutch Museum, has ascertained that birds may be preserved more effectually from the attacks of minute insects, by placing in each case a small wooden basin filled with tallow, than by the employment of either Camphor or Russia Leather.

Preservation of Red Cabbage Colour.—Digest the leaves of the cabbage in warm alcohol; distil off the alcohol from the coloured solution obtained, and evaporate the remainder by a gentle heat until reduced to a syrup. This will keep in closely stopped phials for years. When required for use, a little of it should be added to as much water as will give a test liquor of a proper depth of colour. Test papers may be prepared from the alcoholic solution.—*American Journal of Science.*

Use of Elderberries as a Chemical Test.—Take a quantity of picked ripe elderberries, bruise them, and press the juice into a clean well-tinned vessel; add a fourth of its weight of alcohol, and evaporate to one half; allow it to cool for ten or twelve minutes, add an equal bulk of alcohol, and strain the liquor through a fine cotton cloth from the precipitate which will form. The filtered liquor, now of a beautiful violet colour, is ready for use.

As trials of its sensibility, a drop of the tincture was added to a pint of rain water, the solution was so dilute that no blue colour could be perceived; but a single drop of sulphuric acid produced a decided red colour: a minute quantity of alkali was then added, which immediately changed the colour to a bright green. If only sufficient alkali be added to neutralize the acid, the original blue or violet colour is restored. This test, besides being very delicate, has the important advantage of keeping unaltered during the hottest season of the year.

Mr. Owen calculates that 200 arms, with machines, now manufacture as much cotton as 20,000,000 of arms were able to manufacture without machines forty years ago, and that the cotton now manufactured in the course of one year in Great Britain would require, without machines, 16,000,000 of workmen with simple wheels.—He calculates farther, that the quantity of manufactures of all sorts, at present produced by British workmen with the aid of machines, is so great, that it would require, without the assistance of machinery, the labour of 400 millions of workmen.

Motion of the Electric Fluid.—It has long been received as a fact that an electrical discharge was capable of being transmitted through a very considerable distance (say three or four miles) instantaneously, and without any sensible diminution of its intensity. Mr. Barlow, however, by employing wires of various lengths up to 840 feet, and measuring the energy of the electric action by the deflection produced in a magnetic needle, has found that the intensity diminishes very rapidly and very nearly as the inverse square of the distance; hence the idea of constructing electrical telegraphs is quite chimerical. He found, also that the effect was greater with a wire

of a certain size than with one smaller, yet that nothing was gained by increasing the diameter of the wire beyond a given limit.

Light produced by Chrystallization.—M. Buchner having mixed some impure benzoic acid, perfectly dry, with the sixth part of its weight of vegetable charcoal placed it on a soap plate, which was covered with a cylinder luted to it by almond paste, in such a manner that what took place in the interior could be distinctly seen through an aperture disposed for this purpose. After the whole had been exposed several days to a moderate heat, and some beautiful chrystals formed, it was removed to a hotter furnace, and half an hour afterwards, M. Buchner observed a brilliant flash of light in the interior of the cylinder. A succession of flashes ensued, which completely filled the cylinder, and continued half an hour, when it was taken off the furnace, and examined; a great quantity of chrystals of benzoic acid were deposited; they resembled crystals of the same substance obtained in the usual way by a more moderate heat, and without light, except that they were less regular. M. Buchner attributed this phenomenon to a neutralization of electricity, as it took place at a moment when the chrystal was deposited on the inner surface of the cylinder. The same effect has been noticed on chrystallizing acetate of potassa, and in preparing oxygen by means of chlorate of potassa and manganese.

A new Piece of Artillery.—A report was read on the subject of the experiments made at Brest, on the effects of the new kind of artillery proposed by M. Painham. The piece (canon a bombes) of which trial was made, had a bore eight inches in diameter. The object fired at was an old vessel of eighty guns; each discharge caused such injury as would have entirely have disabled it from continuing in action. The fire of the new piece charged with ten pounds of powder, was much superior to that of a thirty-six pounder having a charge of twelve pounds of powder, at similar angles. The commission was unanimous on the advantages which would be produced by the adoption of this new piece of artillery in defence of places, and in floating batteries placed at the entrance of harbours. It was also equally convinced, that ultimately they would be introduced on board vessels without inconvenience, and thus *have the effect of establishing a sort of equilibrium between vessels of different dimensions.* —*Ann de Chim. Brewster's Journal.*

Temperature of the Sun.—M. Pouillet has been engaged in a series of experiments relative to the measure of very high temperatures, such as those on the surface of incandescent bodies, of ignited bodies, of flames, but more especially the Sun. The instrument employed by the philosopher is founded on the properties of radiant heat, and chiefly on this datum, that a body, the bulb of a thermometer for instance, when perfectly insulated in the midst of a sphere of ice, but so placed as to receive the rays of the sun through a circular aperture of such a form and position that all the lines forming tangents to the sun and the ball may pass through it; will be heated in precisely the same manner as if it were supposed that a portion of the

surface of the Sun, or if a body heated to the same temperature exactly filled the aperture in the ice. M. Pouillet, states, among other results, that the temperature of the sun, thus determined is 1400 degrees (or 2552° Farenheit.)—*Journal de Pharmacie.*

German method of making Flowers Grow in Winter.—We saw off such a branch in any tree as will answer our purpose, and then lay it for an hour or two in a running stream, if we can find one; the object of this is to get the ice from the bark, and soften the buds. It is afterwards carried into one of our warm rooms, and fixed upright in a wooden box or tub containing water. Fresh burnt lime is then added to the water, and allowed to remain in it about twelve hours, when it is removed and fresh water added, with which a small quantity of vitriol is mixed to prevent its putrifying. In the course of some hours the blossoms begin to make their appearance and afterwards the leaves. If more lime be added the process is quickened, while if it be not used at all, the process is retarded and the leaves appear before the blossoms.—*New Monthly Magazine.*

Erlanite, a new Mineral.—This mineral was observed by Breithaupt, in 1818, in different parts of the Saxon Erzgebirg. It forms a part of the oldest gneiss formation, and is always mixed with more or less mica. Between Grose-Pöble and Erla there exists a bed of it, at least 100 fathoms in thickness. It has been used for upwards of 200 years as a flux by the iron smelters, and until its examination by Briethaupt, it had been uniformly mistaken for limestone.

Characters.—Lustre, feeble shining to dull; streak, shining with a fatty lustre; colour, light greenish grey; striated, white massive; sometimes compact, sometimes in small and fine granular distinct concretions: fracture, in some specimens foliated, in others splintery and even; structure distinctly crystalline, but as yet no regular cleavage obtained; hardness, between that of apatile and actionolite; specific gravity, from 3 to 3.1. Before the blow-pipe readily melts into a slightly coloured, transparent compact bead. It resembles gehlenite more than any other mineral; is distinguished from felspar by greater specific gravity, and from saussurite by inferior specific gravity and hardness. It is composed, according to Gmelin, of

Silica	53,160
Alumina	14,034
Lime	14,397
Soda	2,611
Magnesia	5,420
Oxide of Iron	7,138
Oxide of Manganese	0,639
Volatile Matter	0,606
Loss	1,995
	100,000

Ann. Phil. N. S.

Distillation of Wines with Milk.—M. Cadet de Vaux observes, that notwithstanding the great difference in the products ob-

tained by the distillation of the fermented liquors of various kinds of mellow and sweet fruits, they may be purified and very nearly assimilated to each other by redistillation with milk. As an instance of this, he mentions that a liquor which he thus prepared from plums bore a very close resemblance to the Kirschwasser, or cherry-water of the best kind. The wine first obtained from the fermented liquor of the plums, being found unfit for the market was distilled; but the product obtained was weak, precipitated white by the addition of water, and was very inferior in flavour and value. Being redistilled with some milk, the latter immediately curdled, and the product of this second distillation was found to be of such excellent flavour and strength as to be taken by the best judges for the real cherry-water, made directly from the cherries,—*Bulletin des Sciences.*

RECENT PATENTS.

PIANO FORTES.—To Pierre Erard, of Great Marlborough Street, for certain improvements therein. Sealed 5th January. Six months.

STEAM ENGINES.—To Dr. Tilloch, of Islington, for improvements therein, applicable also to other useful purposes. Sealed 11th January. Six months.

NEW MUSICAL INSTRUMENT.—To Goldsworthey Gurney, Esq. of Argyle Street, Hanover Square, for his invention of an improved finger-keyed musical instrument, in the use of which a performer is enabled to hold or prolong the notes and to increase or modify the tone at pleasure. Sealed 11th January. Six months.

CONDENSED WOOD.—To James Falconer Atlee, Esq. of Marchwood, in the county of Southampton, for his new invented process for preventing wood from shrinking, and rendering it more durable, solid, and compact, better suited for building purposes and the construction of furniture; which he proposes to call "Condensed Wood," as wood so prepared will become an article of commerce and manufacture. Sealed 11th January. Six months.

PRESERVING OF FOOD.—To Thomas Magrath, of Dublin, for his new invented composition to preserve animal and vegetable substances. Sealed 11th January. Six months.

NAVIGATION.—To William Shelton Burnett, Esq. of London Street, London, for a new-invented method of lessening the drift of ships at sea, and better protecting them in gales of wind. Sealed 11th January. Six months.

TO OUR READERS AND CORRESPONDENTS.

From the facts that are elicited by the works which are daily issuing from the press upon scientific subjects, we think that we cannot perform a better office than by presenting to our readers occasional reviews of such as may appear to come within the scope of a Register of Arts and Sciences. We shall less assume the character of a critic than that of a reviewer, and we hope, that as our sole purpose will be to inform our readers of what shall be transpiring in the scientific world, we shall never be considered as desirous to exercise an improper and capricious influence upon the public mind in the observations which may from time to time accompany our extracts.

Those authors, therefore, who may wish to obtain a notice of their works in our pages, may rely upon a faithful and prompt attention in the discharge of our newly-imposed task.

Will Adolescens have the goodness to send to the Publisher's for a note addressed to him.

W. L. is informed that Mr. Ayliffe's address is Exmouth Street, *Spa Fields.*

H. L.—S. S.—and O. L.'s favours will have early insertion.

Our other Correspondents will be replied to in our next.

[*To be continued every* Fortnight.]

Printed for and published by GEORGE HEBERT, 88, Cheapside; to whom all Communications (post paid) for the EDITOR are to be addressed—and Sold by SHERWOOD, JONES, and Co., Paternoster Row; SIMPKIN & MARSHALL, Stationers' Hall Court; and may be had of all Booksellers in Town and Country.

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REGISTER

OF

THE ARTS AND SCIENCES.

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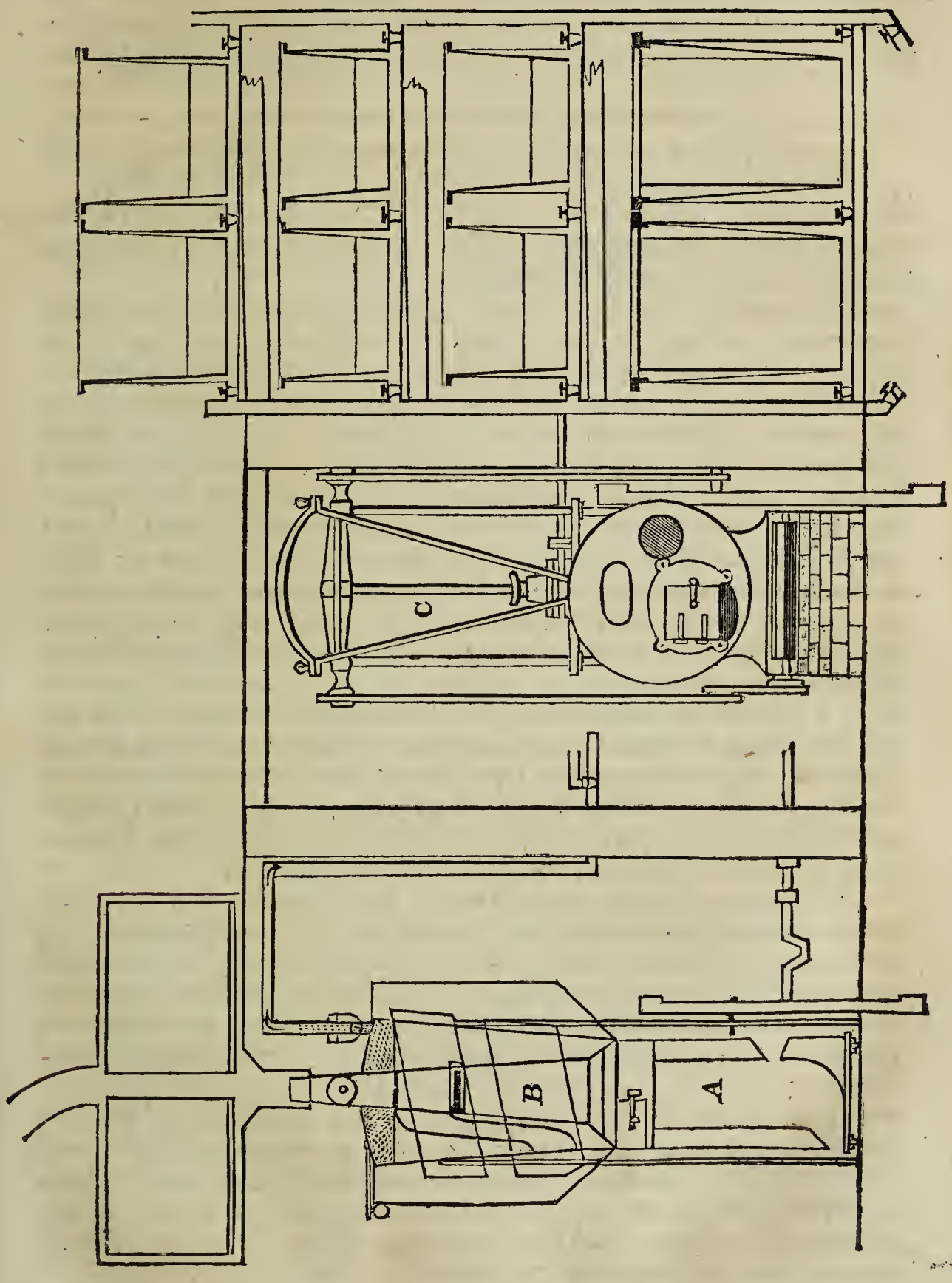


BARTON'S PATENT STEAM BOILERS, &c.

CONTENTS:

Barton's Patent Steam Boilers, &c. 194
Artificial Warmth 196
Railway on a new Principle ... 198
Manufacture of Artificial Pearls at Rome..... ..... *ib.*
Lloyd and Co's Patent Hats.... 199
A Book-binder's Folder..... *ib.*
Dixon's Improved Port-folio for Music, &c. 201
Gunby's Patent Scabbards, &c.. 202
Fussell's Patent Process for producing the Lustre on Woollen Cloth..... *ib.*
Encyclopædia of the Useful Arts, No. VIII..... 203
Elements of Natural Philosophy, No. 23.—Of Telescopes..... 205
Miscellaneous:—Italian Method of Planting through Trees, 207,—Hydrophobia, *ib*—Portable Ship's Masts, 208,—Buckinghamshire Lace, *ib.*—Patents, Correspondents, &c. *ib.*

BARTON'S PATENT STEAM BOILERS, &c.

SPECIFICATION *of the Patent granted to John Barton, of No. 38, Seward Street, Goswell Street, for various improvements in the construction and application of Steam Engines:—*

"The principle of my Patent is in saving the heat of fires which is generally suffered to escape useless, to raise steam, for which purpose I apply boilers or other proper vessels containing water, in the most suitable and convenient place, where the heat can act on with power; which steam, when raised, the most ready method must be taken to connect with the steam-engine boiler. The high-pressure I prefer, as with that I gain another great advantage by the steam; after it has done its work in the engine and passed the cock, I discharge it in vessels having false bottoms and sides by pipes or other methods, being properly secured from the atmosphere by close covers and casing, with which I can dry and heat many things in less time, and with less expence and danger, than by the immediate application of fire to the vessel.

"I fix a boiler which may have a flue through it to take the flame and heat from the cupola to raise steam (which is done quick with the blast which is necessary to melt the iron); to this I connect another boiler as close as I conveniently can, to which the cylinder and other working parts of the engine is connected, with a force-pump to supply water as it will waste by evaporation.

"Furnaces, forges, ovens, kilns, glass-houses, and almost all great heats may be advantageously employed to raise steam for drying or heating, or to work steam-engines, and will afterwards go further for drying, boiling, heating, &c. if properly applied than any other way the same fuel can be used. The principal businesses I know of, in which steam can be advantageously used, are maltsters, dyers, distillers, brewers, sugar-houses, sugar-plantations, hop drying, salt works, tallow melters, powder drying, or any inflammatory business where drying or boiling is required: it is particularly well adapted for warming manufactories, drying-houses, hot-houses, or any houses or buildings whatever for which it can be applied, as there is no fear of fire or explosion. The chief advantage under my patent is doing two or three works by the heat originating from one fire.

" By this explanation the general outlines and various applications of my patent may be understood, and applied by any intelligent engineer, with the assistance of a practical workman understanding the business to which it is applied. I claim some improvement in the steam-engine,—I use the cock for reversing the steam with two sides cut out, by which I can reverse the steam by turning the cock about one-sixth round, so the steam on the piston is changed much quicker. I likewise use the piston very short, and I have holes cast or drilled nearly through the piston between the screws which tighten the cap, to put in tallow when I pack the engine; this tallow escapes by small holes drilled horizontally into the holes where the tallow is, so it keeps the packing greasy, and will wear much longer, and work much better than the common way.

" The method I use for raising steam from gentlemen's fires is, to have a hollow tube pass through the fire, in which water is always supplied by the engine or other boiler, to which it must be connected in a proper manner, so as to be removed at pleasure; this will be found a cheap way of warming the house, which the patentee makes on a cheap and simple plan."

The preceding engraving shews a cupola A employed for the casting of metal, B a boiler over the same for the generating of steam, which is conveyed to and works the steam-engine C. The steam having done its office in giving motion to the piston, passes from the cylinder and encompasses the several boilers *on the right* entering between their double casings; the communication being cut off between them as occasion requires by a series of cocks placed in the situations shewn. The lids of the boilers are constructed with manholes, and to shut air-tight. The pipe at the extreme end of the apparatus, on the right, is for supplying water to condense the steam, whenever desired; so that by opening or shutting the several cocks any of the vessels may be either heated or cooled at pleasure. The method by which the patentee effects his vacuum, is stated by him to be, by opening a communication from a hot to a cold vessel, by which a vacuum in the former is partly effected, and subsequently completed, by having recourse to the before-mentioned water pipe to condense the vapour. The lower boilers or cisterns have double covers, and the pipe for conveying off the steam from each only enters the upper one; the inside covers and side casings represented by the inner lines are perforated with numerous small holes to allow the vapour to escape. The darkly shadowed upper parts of the boilers are intended to represent deep and strong flanges, which are so affixed, for the connecting of the several pipes and cocks required, as well as for giving stability to the whole.

Above the boiler B is an oven heated by the flue from the furnace; situated in this manner it has been found particularly serviceable in founderies for drying the cores employed in casting.

For the boiling of sugar and other manufacturing processes, the cisterns have been found peculiarly advantageous; and they have been applied in dyeing and in various ways on an extensive scale with considerable recent improvements by the patentee.

Although eleven years have elapsed since this invention was patented, it has nevertheless some strong claims upon the public attention. By the date of the Specification it appears to have been the earliest patent for an apparatus for boiling in vacuo, even prior to that of Mr. Howard's, which has received such very general encouragement. The economy of employing the waste heat of the furnaces of manufactories for generating steam to work an engine, and afterwards employing it for the heating of a series of vessels or apartments, for boiling, drying, evaporating, &c. is truly admirable; and it admits of such various and extensive applications as to allow of scarcely any limit to its usefulness. In smitheries and founderies in particular it has been found that the heat which usually escapes unemployed from a furnace capable of melting ten hundred weight of iron at a time is sufficient to generate steam for a three-horse engine, which latter in return gives motion to the machinery that works the bellows, grindstones, &c.

The apparatus drawn is intended merely to shew the principle of its construction, and is therefore unattended with the several adaptions which every skilful engineer knows well how to supply. Mr. Barton being a man of considerable inventive talent, has not failed to avail himself of several valuable improvements therein; which not having been patented by him, we do not feel ourselves warranted in describing.

ARTIFICIAL WARMTH.

(Concluded from page 181.*)*

In our last Number we gave the only account of the apparatus with which Mr. Boyce has furnished us, and we regret that it was not sufficiently detailed to be tangible to the mind in the absence of some illustrative drawing. Having shewn the errors and inadequacy of open fires, as a means of obtaining warmth, our author proceeds to make the following amusing yet just remarks on their general effects as compared with those resulting from his improved apparatus.

"Nothing can be more striking than the difference of sensation immediately experienced, on entering a house warmed on the new system, after leaving one *attempted* to be warmed upon the old: instead of numerous dull and smoky fires, struggling to diffuse some scanty portion of heat into the damp and chilling apartments, and requiring continual care, to prevent even that little from being entirely lost, you enter at once into a softer and more genial atmosphere, that in purity, in agreeable warmth, and in its freedom from all former sources of annoyance, seems to afford, even in the deepest severity of an English winter, all the rich luxury of an Italian climate. Instead of being obliged, as formerly, when desirous of warmth, to fix yourself within a few inches of the grate, with your face blazing in a heat of 120°, while your back is chilled in a draught at 30°, you may here choose your station wherever it pleases you, secure of suffering no change of temperature, even in the remotest corners.

At meals and social parties, instead of being under the necessity of scorching to death one half your friends and freezing into discontent the other, all are placed under the same pleasurable circumstances, and are alike exempted from those distressing extremes, so unfavourable to the enjoyment of hospitality. No longer clouds of dust continually settle upon your furniture, food, and apparel—no more domestic debates, and protracted arguments, on the propriety of stirring or not stirring the fire—smoke no longer has power to annoy; nor is it beneath regard, in these economical times, that all these advantages are procured, not by an increased expense in the wages of labour, but by a considerable saving in that respect; for it is not too much to assume that one-fourth of the domestic labour required in an English family of any respectability, is occupied exclusively in making up and attending to the various fires, and in removing the dust and dirt they so plentifully occasion:

"But, beyond all selfish considerations of comfort or economy, there is an infinitely more important property attending the new method, that, to the mind of every man of feeling or humanity, must carry with it an irresistible appeal—ITS POSITIVE SAFETY."

He then adverts to the advantages to be thus derived by invalids, the aged, public schools and offices; and places these advantages in a most conspicuous point of view. With respect to infant nurseries, he observes,—

"It must be known to every one, at all familiar with the practices and habits of little nursery inmates, with what eagerness, in winter, they love to gather round the source of warmth, and how often, in spite of repeated injunctions, they seize every moment of relaxed vigilance, to sport with the alluring flames, always to their imminent danger, and too often to their own destruction. Were they, on the contrary, placed in an apartment deriving its proper and healthy degree of warmth from the intromission of heated air, no danger could be apprehended, no caution be necessary; and how many fearful accidents might be consequently avoided!"

"In the Library and the Study, this system of affording warmth, in addition to its increased powers of repelling damp, offers to the philosopher and the student the desirable advantage of complete freedom from all household interference. Hitherto they have been able to claim in these territories only a divided empire, subject, as they were, to the continual inroads of the house-maid, on her never-ending business of 'looking after the fire.' In the early mornings of winter, the same personage exercises in these realms exclusive jurisdiction:—it is then, that armed with brush, duster, and coal scuttle, she enters to rebuild another smoky structure, whilst every thing is deranged in the necessary operation of removing the dust and dirt occasioned by yesterday's fire; and woe to the straggling manuscript and uncollected volume which, the night before, you omitted to place safely away! 'Thoughts that breathe and words that burn' may be ingloriously doomed to feed the reluctant flames, and your favourite work exhibit on its delicate margins unwelcome proofs of her literary curiosity. Wherever the new system of warming is adopted, it is

plain these disastrous consequences cannot occur: the treasures of the Bibliomaniac will then be safe from damp, his shelves be free from dust, and his hours of study secure from domestic interruption."

We would willingly give further extracts, but our limits must prevent us, and we cannot conclude without strongly recommending this little *brochure* to the perusal of those of our readers who feel at all interested in the comforts of artificial heat.

RAILWAY ON A NEW PRINCIPLE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"THE formation of Railways, and the important results anticipated from them now engaging so much public attention; it may not perhaps be uninteresting to some of your readers to be informed that a sort of wheel, termed *scapa,* has been invented, which forms a Railway for itself as it goes, while travelling on common ground, and by which means the rolling on the ground is avoided. The inventor has been engaged for several years in the attempt to render it as perfect as he is able, and in the course of which has constructed several machines and models of the same, all on plans essentially different from each other. He has also constructed some sorts which act even without forming a railway, and with an equable motion avoiding the friction produced by a railway itself. A patent has been granted for these machines, and a description of some of the first plans with plates is given in the Repertory of Arts, plate 7 and 8, vol. 26, April 1814, but which are considered by the inventor as too complicated; and some better plans follow in vol. 39, June 1821, of the same work, shewn in plates 2 and 3. Two later kinds with plates are described in his small work, entitled '*Moral Enquiries,*' published by Simpkin and Marshall, Stationers'-hall Court, and the best is that which is explained in the Appendix; but of this last he has not constructed any carriage excepting a model, though he has the object in contemplation, unless he should receive information that some person is willing to undertake it instead, and before he begins it himself at such person's own expence and risk, in which case he will endeavour to render its success advantageous to him, the same being completed in a reasonable time, and in strict conformity to the model or to the advice of the inventor.

"I am, your obedient Servant,

"L. G."

MANUFACTURE OF ARTIFICIAL PEARLS AT ROME.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IN perusing a Number (I think 33) of your truly valuable Register, I observed an account of the manufacture of French Artificial Pearls; I shall now take the liberty of calling your attention

to those made at Rome, which possess considerable advantages over the former. The Roman Pearls are formed of a very pure alabaster, considerable quarries of which exist near Pisa, in Tuscany. The process is as follows :—The alabaster is first sawn into slices, the thickness of the pearls required; the pearls are then formed with an instrument which bores a small hole in the centre at the same time that the required shape is obtained. The next thing in the process is their immersion in boiling wax to give them a rich yellow hue, and afterwards to cover them several times with the silvery substance, obtained from the scales of the bleak. The singular beauty of this ornament which perfectly resembles the real pearl, the varied patterns in which they are arranged, and their extreme cheapness render them an object much sought after, while their solidity is such that they may be dashed to the ground with violence without receiving the slightest injury; being thus rendered far superior to those of French manufacture, which are at once more fragile, and considerably less imitative.

"If you should find these remarks worthy of insertion in your excellent Register you will extremely oblige your constant admirer,

"And obedient humble Servant,

"*Bucks, Feb. 9th,* 1825. "VIATOR."

LLOYD AND CO.'s PATENT HATS.

Mr. Robert Lloyd, of the Strand, in conjunction with Mr. James Rowbotham, of Blackfriars Road, have taken out a patent for a hat upon a new construction. The object of the invention seems to be to supercede the necessity of the dress or cocked hats in crowded assemblies, being made like them to fold up and wear under the arm. For this purpose they are constructed on the principle of the telescope; that is to say, they are composed of a series of short cylinders which slide one within another, and thus enables the wearers to contract or expand them at pleasure. This property likewise is found to be of advantage in wearing them in a carriage, as the height of the crown may be accommodated to the roof of the vehicle. The means by which the patentees propose to give a hat these desirable qualities are various, but none of them are very clearly explained in the Specification.

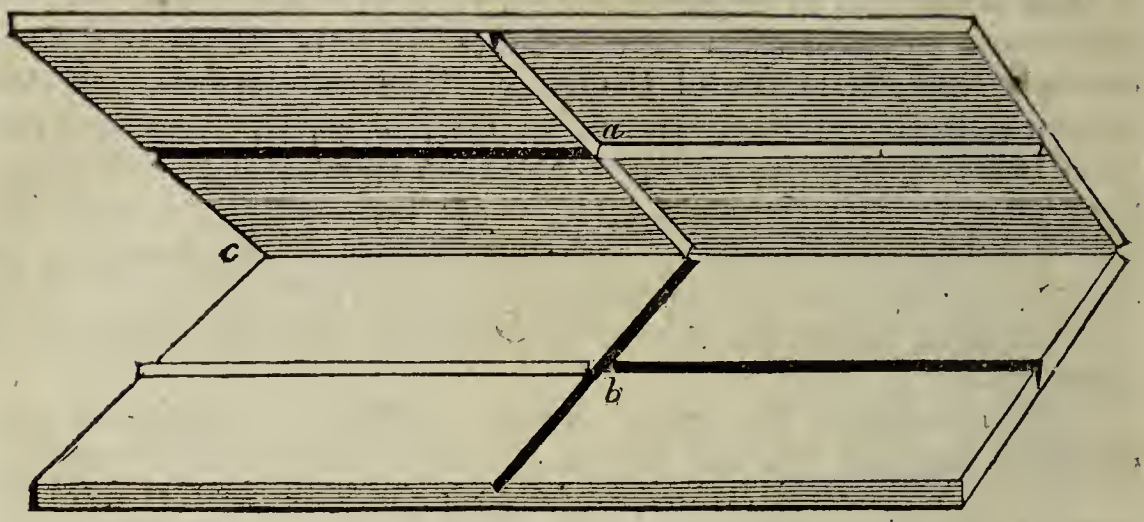
A BOOK-BINDER'S FOLDER.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"Having frequently noticed the irregular breadths of margin that occur in bound books, as well as the *unopposite* situation of the numbers to the pages; I was led to consider of some means to prevent so great a disfigurement to good books. The operation of folding a sheet of paper, consisting of a number of printed pages, requires great care to make the numbers meet exactly, and the necessary

dispatch in the performance is not acquired but by dint of long practice. It sometimes happens likewise that errors are made in the successive arrangement of the pages by folding over the wrong way, producing thereby great inconvenience in the reading. These several disadvantages I propose to obviate by a very simple apparatus, which I will take leave to call a Bookbinder's Folder; and the annexed drawing is a perspective representation of the same.

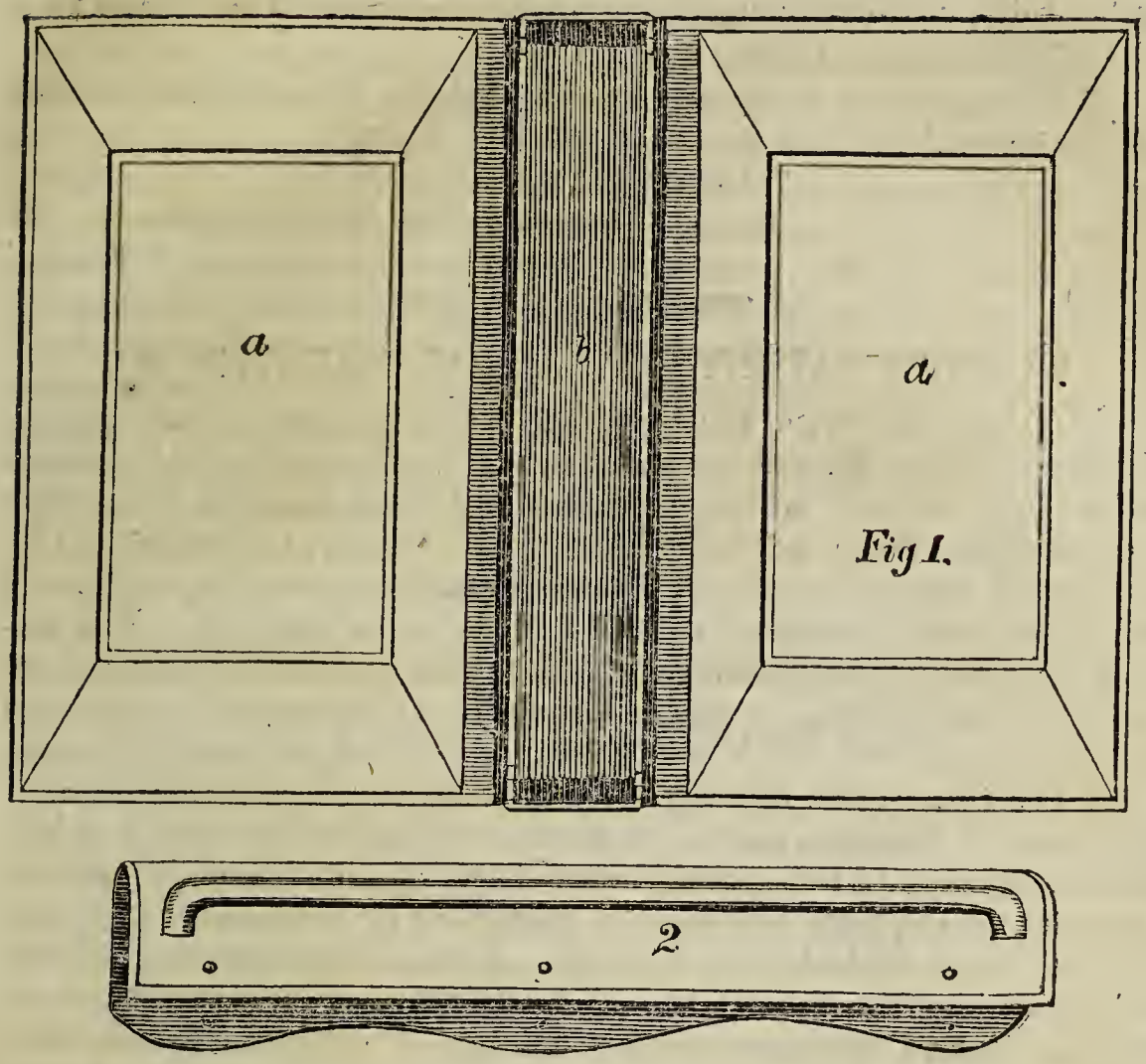


" *a* and *b* are two boards kept open by a spring, and connected together by a pair of hinges at their back edges; these boards are to be of the size of a sheet of printing paper, and about three quarters of an inch thick. Both the upper and the lower board are to be accurately divided into the proper number of compartments according to the form of types, or the kind of book, whether quarto, octavo, duodecimo, and so forth; and the boundary lines of each compartment or page is formed by little bars and grooves, the former fitting into the latter; and so arranged on the upper and lower side, that the compression given to the paper between them makes a series of creases in the proper direction the sheet is to be folded; so that when the paper is taken out it readily *falls* almost into the folds, like a pocket map divided in the usual manner. For the sake of clearness the apparatus is drawn as adapted for quarto folding;—for smaller sized pages, the compartments, ledges, and grooves, would be arranged accordingly.

" The cost of the Folder need not exceed a few shillings, and from its simplicity it would not be easily deranged. The quickness with which very accurate folding may be executed by it is obvious; the sheets are taken up one by one, and laid with the two pin-holes (that are in every sheet) over the middle line, the upper board is then slightly pressed upon by the hand; the hand being removed, the sheet of paper is relieved, (by the spring at the back opening the apparatus) it is then accurately doubled up without any particular attention: sheet after sheet are operated upon in like manner, and with much greater dispatch and *correctness* than can be done by the ordinary method of folding.

" Your obedient Servant,

" H. L."



DIXON'S IMPROVED PORT-FOLIO FOR MUSIC, &c.

" To the Editor of the Register of the Arts and Sciences, &c.

" SIR,

" HAVING recently purchased one of Dixon's Port-folio's for Music, I have found it so extremely well suited for the purpose designed, that I am desirous of making it more generally known through the medium of your widely-circulated and useful Journal.

" *Fig.* 1 shews the inside of the Port-folio lying down open and flat. The two covers, *a a*, are made very neat and substantial, and are ornamented with a variety of devices usual in book-binding; the backs are also similarly formed to those of other books, and they are lettered according to the several purposes they are intended for, such as *Music, Letters, Invoices,* the names of *Newspapers,* and all other papers that require filing, which operation is effected by this port-folio with greater dispatch than by any other, and without the slightest injury to any of the papers; while it admits of the removal of any single papers or pieces of music without disturbing or unfastening the others. At the upper and lower ends of the back are fixed metallic clasps which embrace and strengthen the edges, on to each of which is rivetted a brass rail, extending to nearly the breadth of the back: the form of this brass rail and clasp is shewn separately by *Fig.* 2. A series of fifty or more plaited lines shewn at *b* are neatly attached

to the rails, and under each of the lines a paper is slipped, and kept in that situation by folding over.

"It is perhaps necessary to add that the manufactory for this article appears to be at No. 3, in the Old Bailey.

"I beg to remain, Sir,

"Your obedient humble Servant,

"W. L."

GUNBY'S PATENT SCABBARDS, SHEATHS, &c.

Mr. John Gunby, of the New Kent Road, gun maker, has recently obtained a patent for making sheaths, scabbards, and cartridge-boxes upon a new method, which are stated to be less liable to decay than those hitherto made, perfectly impervious to water, and unaffected by the heat of warm climates. The scabbards for swords, bayonets, and dirks, are usually made of curried leather, sewn together. The method proposed by the patentee to make them is to employ thin leather made of sheep skins, or paper, or cloth, which are to be cut into strips of the proper width and length, and the edges joined with glue or paste; these when dry are to be covered over again with another thickness of leather, paper, or cloth, overlapping the joints of the first covering. In like manner other coverings may be added till obtained of the required substance. The joints and other elevated parts are then to be rubbed down smooth. A coat of oil colour or varnish is then to be given to both the outer and inner surfaces, and suffered to dry; several successive coats of oil colour and varnish are to be added, drying each thoroughly before the next is laid on. The drying may be performed either in the air, or in a drying stove.

In the making of cartridge boxes the internal part is made of wood as heretofore, the external in the same manner as the scabbards already described. The lid or flaps of the cartridge boxes are to be made of millboard, cut the proper size and shape, and then saturated with a solution of glue mixed with about a fourth part of boiled oil, which mixture is effected by agitation with the ingredients moderately heated. Before the lids so prepared have become dry, the required form is to be given by pressing them between an outer and inner mould of wood, made of the proper shape, under which pressure they remain until they are dried and hard; they are then taken out of the moulds and coated in the same manner as the scabbards before mentioned.

FUSSELL'S PATENT PROCESS FOR PRODUCING THE LUSTRE ON WOOLLEN CLOTH.

This is a patent granted to Mr. John Fussell, the celebrated edge-tool manufacturer, of Wells, Somersetshire, for a very simple and effectual operation for giving a lustre to woollen cloth, after it has undergone the usual dressing in the gig-mill, and hand brushing. The cloth is to be tightly rolled upon a cylindrical roller,—the extremities of which are to have deep grooves round their peripheries,

which will permit the list on the edges of the cloth to sink into them, and by these means preserve the cloth in a smooth and level surface. The roller of cloth so prepared is to be set on an end for some time to permit the water to drain off; it is then to be placed in either an open vessel over a steam boiler, and exposed to the action of the steam for three hours, or it may be placed in a close vessel, into which the vapour is allowed to enter from a generator. Another method proposed by the patentee is to coil the cloth round a hollow cylinder or tube, through which the steam is to be allowed to pass while it is made to revolve. The temperature of the steam proper to be employed must depend upon the colour of the cloth, and the lustre required to be produced upon its surface, but in general the heat must be somewhat below that of boiling water.

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. VIII.—*(Continued from page 158.)*

AMMONIA, or Volatile Alkali, under the head of Alkali, (page 60) we mentioned some of the peculiar properties of this substance, to which we must now refer the reader, confining ourselves here to a description of several of the methods by which it is manufactured, and of its uses in the arts.

Ammonia, as before-mentioned, cannot be obtained in a pure state, except in the form of gas; to obtain which the following process is recommended in most chemical works:—Put into a retort two parts of unslaked quick lime with one part of crude sal ammoniac, previously reduced to powder; plunge the neck of the retort beneath the mouth of a glass jar previously filled with mercury and standing inverted in a basin containing that metal; then apply a very gentle heat to the retort and ammoniacal gas will bubble up through the mercury and fill the jar, by displacing the metallic fluid. Pure ammonia thus obtained, is transparent and invisible as the common atmospheric air, and may be preserved in that situation for any length of time. It cannot be kept over water as it is rapidly absorbed by that liquid as well as by most others. Next to hydrogen, ammoniacal gas is the lightest of all gaseous bodies. Its specific gravity has been variously stated; Sir H. Davy has estimated it at 0.55, that of atmospheric air being 1.00; or rather more than half the weight of the latter.

This gas has an exceedingly pungent odour, and is well known by the name of *spirits of hartshorn,* from having been formerly obtained by distilling the horns of the hart.

Water combines very rapidly with ammonia, taking up one third of its weight of the alkali, or about 460 times its bulk.

The liquid ammonia is prepared by several methods. That which has been most usually practised is to mix together quicklime, muriate of ammonia, and water, and to distil the mixture by a very gentle heat. The London Pharmacopœia directs the preparation to be made

as follows ; take two pounds of lime slacked in two pints of water, and one pound of sal ammoniac, which are to be mixed with six pints of hot water, and to be kept in a covered vessel till cold. The liquor is then to be distilled, and the first pint which comes over is to be considered as the pure liquid ammonia. This liquor is however by no means saturated with the alkali ; a more effectual way of preparing it is to disengage the gas from the dry materials by the employment of a Woolfe's apparatus ; for this purpose take two parts of lime slacked in the smallest quantity of water, and mix therewith one part of the dry muriate of ammonia, and place them in the retort for the production of the gas ; and in the condensing bottles, a quantity of water equal in weight to the sal ammoniac employed ; and when the bubbles pass through the water undiminished in their bulk, it may be known that no further absorption takes place, and consequently that the liquid is thoroughly saturated with the alkali.

Ammonia unites with all the acids with great rapidity, thereby forming very soluble salts. The union of alkaline air with the acid gases, discovered by Dr. Priestley, forms some of the most striking and beautiful experiments which chemistry furnishes ; one of which it will be proper not to omit the mentioning of. If ammoniacal gas be passed up into a jar containing muriatic acid gas, a thick white cloud is immediately produced, the two pungent-smelling gases by uniting lose their gaseous form, and a scentless solid salt is the result, being the crystalline feathers of muriated ammonia.

Of the several combinations of ammonia with the acids, we shall notice those only that have been brought into use in medicine and the arts ; which are, the *acetate* of ammonia, formerly called the spirit of Mindererus ; and the *muriate* of ammonia, commonly denominated sal ammoniac.

The acetate of ammonia, employed in medicine as a febrifuge and sodorific, may be made by saturating pure acetic acid with sub-carbonate of ammonia, and inclosing the liquid under the receiver of an air pump, together with a saucer-full of sulphuric acid ; upon exhausting the air the salt will concrete into acicular crystals, which are nearly neutral. This salt has a cooling sweetish taste. It is deliquescent, and volatile at all temperatures. It is usually kept in the liquid state, forming the spirit of Mindererus of the apothecary.

Sal ammoniac was originally manufactured in Egypt, and being brought to us from the town of Ammonia in Syria, it thence derived its name, salt of ammonia. The process of manufacturing it in that country is said to be as follows. The dung of camels and other animals constituting the principal fuel used in that country, the soot which resulted was carefully collected. Globular glass vessels about twelve inches diameter are nearly filled with this soot, and arranged in an oblong furnace, and exposed to a heat which is gradually increased. The upper parts of the glass balloons stand out above the furnace, and are kept relatively cool by the air. The operation is completed on the third day, at which time they occasionally plunge an iron rod into the mouths of the vessels, to prevent them from being closed up and endanger their bursting. The fire is then allowed to go out,

and the glass vessels when cooled are broken. Their upper parts are then found to be lined with hemispherical lumps of sal ammoniac, about two inches and an half in thickness, of a greyish white colour, semi-transparent and possessed of considerable elasticity. Twenty-six pounds of the soot is found to produce six pounds of sal ammoniac.

In Europe the common method of making sal ammoniac, is by combining the ammonia resulting from the burning of animal substances with muriatic acid, in close vessels cast iron cylinders, placed horizontally over a furnace, are charged with horns, bones, parings of hides, and other animal matters, and exposed to a red heat, which causes a large quantity of an impure liquid carbonate of ammonia to distil over. To convert this liquid into sal ammoniac a very economical process has been adopted. The impure liquid is made to percolate through a stratum of bruised gypsum, whence resulted a liquid sulphate of ammonia, and an insoluble carbonate of lime. The liquid is next evaporated to dryness, mixed with the muriate of soda, put into large glass balloons, and exposed to a subliming heat. The result of this elegant process is sal ammoniac in its characteristic cake at the upper part of the vessels, and sulphate of soda below.

Another process of great elegance for obtaining sal ammoniac on the large scale, has been invented by M. Leblanc, of St. Denis, near Paris. He employed compact brick-kilns instead of iron cylinders, for holding the materials to be decomposed. Into one he put a mixture of common salt and oil of vitriol; into another animal matters. Heat extricated from the first muriatic acid gas, and from the second ammonia, which were conducted by their separate flues into a third chamber lined with lead, and containing a stratum of water in its bottom, entered into combination and precipitated in solid sal ammoniac on the roof and sides, or in liquid at the bottom.

(To be continued).

THE ELEMENTS OF NATURAL PHILOSOPHY,

(Continued from page 172, Vol. 2.)

No. 23.—Of Telescopes.

The solar Telescope is a curious instrument, and is applied to use in the following manner: a scioptric ball and socket being fastened against a hole in the window-shutter in a darkened chamber, place the end of a common refracting telescope with its object-glass and eye-glass into the cylindrical hole of the scioptric ball, and draw out the tube to its proper length; this being done, the telescope and ball are moved about until it receives the sun-beams perpendicular on the object glass through the cylindrical hole of the ball; the tube with the eye-glass is then to be adjusted by moving it either in or out, until the image of the sun, formed on a white plane or screen is very distinct, large, and luminous.

In this manner the sun's face is viewed without offence to the eyes, and whatever changes happen thereon may be most accurately observed: the spots, which are seldom seen even when viewed through

small telescopes in the common way, are here conspicuous, and easy to be observed, with all the different circumstances of the spots beginning to appear; their increase, divisions of one into many, or the uniting of many into one their magnitude, decrease, and disappearance.

An eclipse of the sun may, by the solar telescope, be viewed to the greatest advantage, we having it in our power to represent the face of the sun as large as we please, consequently the eclipse proportionally conspicuous; the circle of the sun's disk may be so divided by lines and circles drawn thereon, that the quantity of the eclipse intimated in digits, may this way be exactly determined; also the exact time of the beginning, middle, and end of it, for determining the longitude. The transits of Mercury and Venus over the face of the sun, are exhibited most satisfactorily; the planets appear truly round, well defined, and very black: their comparative diameters to that of the sun, the direction of their motion, and the times of ingress and egress, are here received to the greatest perfection. The heliostata, to take off the inconveniences which arise from the motion of the earth, in making experiments on the solar light, was an excellent invention of Dr. Gravesand: it consists of two principal parts, each of which consists of many smaller parts. The first is a plain metallic speculum, supported by a stand; the other is a clock, which directs the speculum according to the earth's motion, keeping the sun in the same point of view.

THE MAGIC-LANTHORN, AND PHANTASMAGORIA.

The magic-lanthorn is a small machine which has been generally used for amusing children, by magnifying paintings on glass, and throwing their images upon a white screen in a darkened chamber. But it is capable of being employed for more important purposes by using such figures that will explain the principles of astronomy, botany, &c.; its construction is very simple; it consists of a tin lanthorn, within which is a lamp, whose light passes through a great plano convex lens placed in a tube fixed in the front. This strongly illuminates the small transparent painting on glass placed before the lens in an inverted position; another tube, containing a convex lens, slides within the other, so as to adjust the focal distances of the glasses. The illumination is often increased by means of a convex mirror placed at the back of the lamp. To render the picture distinct, no light should fall upon it but what passes through the lens.

The exhibition called the phantasmagoria, which has lately excited so much admiration, is nothing more than a magic lanthorn constructed in a peculiar manner. In the common lanthorns, the figures are painted on the glass, but all the rest of the glass is left transparent, consequently, the image on the screen is a circle of light having a figure on it. But in the phantasmagoria, all the glass is made opaque except the figure only, which, being painted in transparent colours, the light shines through it; for this reason, therefore, no light can come upon the screen but what passes through the figure itself: consequently you have upon the screen a figure only, without any circle

of light as in the common magic lanthorn. Instead, also, of the representation being made upon a wall, or a sheet, as is usually the case, it is thrown upon a thin screen of silk placed between the lanthorn and the spectator. The appearance of the image approaching and receding, is owing simply to removing the lanthorn farther from the screen or bringing it nearer to it: for the size of the image must increase, as the lanthorn is carried back, because the rays come in the form of a cone; and as no part of the screen can be seen, the figure appears to be formed in the air, and to move farther off when it becomes smaller, and to come nearer as it increases in size, though, in reality it is still at the same distance.

(To be continued).

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Italian Method of Planting through Trees.—The gardeners of Genoa, Florence, Venice, &c. choose an orange-tree, which they deprive of its branches, and then perforate the trunk through its whole length, and also through the roots to the ground beneath. Young plants of the jasmine, the dwarf almond, with double flowers, fig-trees, rose-trees, myrtles, and other ornamental plants, are then selected, which they arrange in twos, or threes, according to fancy, and the size of the aperture in the orange-tree, and plant them in the ground, or in a tub, according to the climate, passing them through the orange tree, so that the plants may reach a short distance above the upper end of the trunk; the roots of the tree are then covered with earth, watered, and cultivated, as if it were a tree just planted. The tree and all the young plants then grow together, and will live for ten or fifteen years.

Hydrophobia.—Dr. Capello, of Rome, in a memoir, read before the Academy die Lincer, affirms that the hydrophobia poison, after its transmission, loses the power of conveying the disease. This observation already made by Bader, is confirmed by repeated experiments made by Dr. Capello. A lap-dog and cat were both inoculated with the saliva of a dog who died of *inoculated* hydrophobia; they both remained free from disease, and three years afterwards was again inoculated from a dog who became rabid spontaneously; he then took the disease and died.

An ox was bitten by a dog, attached with rabies; he became hydrophobic, and bit many other animals: all remained free from the infection. The dog that bit the ox also bit a child, who died about four months after, with all the symptoms of hydrophobia: with the saliva of this child a dog was inoculated, but the disease was not transmitted.

A dog which had been bitten by another dog became hydrophobic on the fifty-first day, broke the chain with which he was fastened, and escaped into the street, where he bit many persons, and the dogs of two persons (who are named), and finally disappeared among

the ruins of the villa of Quintilius Varus; not one of the persons or dogs so bitten had the slightest symptom of hydrophobia.—*Med. Jour. III.* 433. *From Journ. Roy. Inst.*

Portable Ship's Masts.—Some framed masts in portable pieces are now in preparation in the dock-yard at Portsmouth, said to be upon Sir Robert Sepping's plan; which are to be carried out in ships to replace masts that may be lost or damaged. Mr. Rice is going out with a set of these masts to South America, to superintend their being fitted in the Spartiate of seventy-eight guns, which is there disabled, from rotten masts, and afterwards to sail in her, to make observations and report as to their sufficiency in blowing weather.

Buckinghamshire Lace.—Considerable quantities of bobbin-net English Lace, made at Nottingham by machinery (in imitation of the Buckinghamshire Lace made by hand over the pillow), is constantly sent to France, and bought by the natives as a superior article of their own manufacture, which is taken back to England and sold as French lace. How easily the prejudiced are imposed upon!

RECENT PATENTS.

CARRIAGES.—To Daniel Stafford, Esq. of Liverpool, for certain improvements in carriages.—Sealed 24th December. Six months.

LACE MAKING.—To John Heathcote, of Tiverton, Devon, for improved machinery for making lace net, commonly called bobbin net.—January 1st. Six months.

To William Heason, and William Jackson of Worcester, for improved machinery for making lace or bobbin net.—Sealed 11th January. Six months.

WEAVING.—To Francis Gibbon Spilsbury, of Leek, Staffordshire, silk manufacturer, for certain improvements in weaving.—Sealed 11th January. Six months.

SPINNING.—To William Hirst, of Leeds, cloth manufacturer, for certain improvements in spinning, and slubbing machines.—Sealed 11th January. Six months.

SAW MILLS.—To George Sayner, of Hunslett, Leeds, York, and John Greenwood, of Gomersall, York, for improvements in the mode of sawing timber by machinery.—Sealed 11th January. Six months.

PAPER MAKING.—To John Phipps, Esq. of Upper Thames Street, London, and Christopher Phipps, Esq. of River, Kent, paper makers, for improvements in machinery for making paper.—Sealed 11th January. Six months.

FOUNDING.—To William Church, Esq. of Birmingham, for certain improvements in the casting of cylinders, tubes, and other articles of iron, copper, and other materials.— Sealed 18th January. Six months.

TO OUR READERS AND CORRESPONDENTS.

Erratum.—We consider it proper to notice an error of the Press which was overlooked in the proof of our last number:—for Mr. Curdy, read Mc. Curdy, (Major).

Adolescens' last favour, will be inserted in our next number, if possible.

A further Communication from L. G. on the same subject will be readily inserted.

W. M.—S. S.—A Mechanic.—A. B. and W. H. are received.

[*To be continued every* Fortnight.]

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REGISTER

OF

THE ARTS AND SCIENCES.

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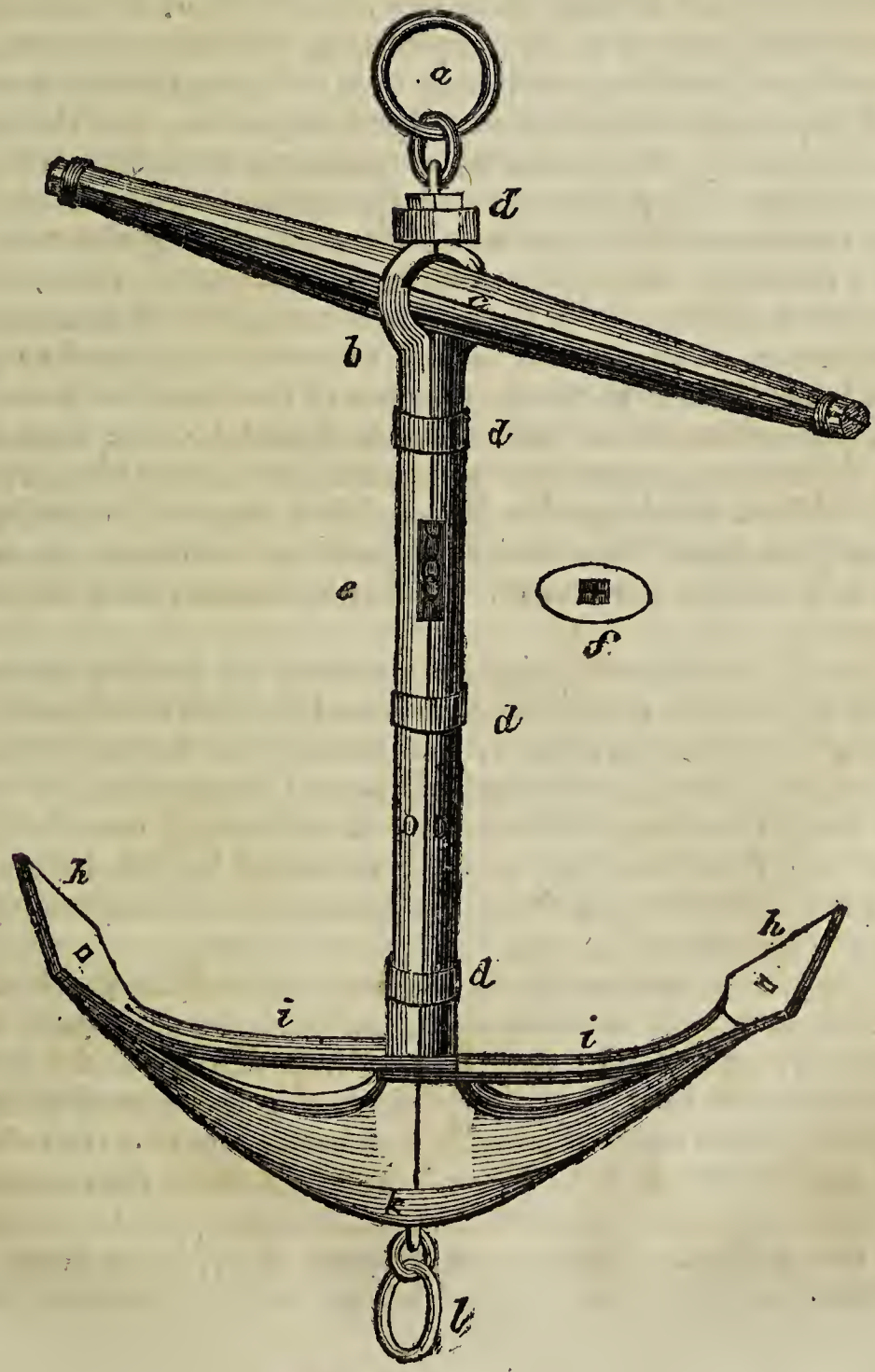
CONTENTS:

Hawke's Patent Anchors 210
Cleland's Sugar Apparatus 212
Pope's Patent Metallic Sheathing 213
Dickenson's Apparatus for clearing Beer 214
Etching upon Steel Plates..... 215
Sea Alarum 216
Improved Fire Escape 217
Vaughan's Steam Engine 218
Brown's Gas Engine 219
Provincial Portable Gas Company 221
Preparation for the Destruction of Vermin, &c. 222
Burning of Charcoal in close Rooms..... 223
Patents, Correspondents, &c... 224



HAWKES'S * PATENT ANCHORS.

To cause two pieces of iron to unite by the process called welding, they must be brought to a degree of heat approaching to that of fusion; and if this heat be exceeded or continued too long, the metal becomes what is technically termed *burnt*, the effect of which is, the loss in a greater or lesser degree of its tenacious and flexible properties, and the acquiring of a crumbling brittleness which renders it wholly unserviceable. However attentive and expert the workmen may be, the process of welding must notwithstanding be one of great uncertainty, and the difficulty and risk of effecting it in a perfect manner are increased in proportion to the enlarged dimensions of the iron. Workmen cannot however be found uniformly attentive, and observation upon what is going forward in the forge cannot always be made where the iron is exposed to ignition from the blasts of the bellows, or to the presence of sulphur in quantity among the coals. When the welding of a large mass like the shank of an anchor, of several tons in weight, is to be completed by the sledge hammer, the workmen are subjected to a scorching heat radiating therefrom which renders it impossible to make a very close inspection, and the consequence is frequently, the beating up or enclosing of *cinders* within the body of the iron. To this cause and that of *burning* are to be attributed the numerous broken anchors that we see lying about our sea ports, of a thickness and apparent strength that excites the astonishment of most beholders. To these causes may likewise be attributed the more serious effects of the loss of numerous ships and cargoes, and more lamentable still, the destruction of thousands of lives.

The construction of an anchor which should be free from these alarming defects is necessarily a desideratum of national importance, and to Mr. Hawkes belongs the distinguished merit of inventing one that not only possesses these desirable qualities, but others also which entitle it to a decided preference. The specification, now before us, states that,

"The anchors at present in use are made by forming the shank and flukes separately, and by the fusion and the power of beating are united or welded into each other, and the cable is fastened to a ring or shackle passed through the shank sideways: the stocks, if of wood, are let or scored over each side and bolted and hooped over the shank of the anchor; if of iron, the eye for it is formed by punching a hole through the shank of the anchor: the palms are made separately and welded on to the flukes."

"My improvements consist in forming a part of the shank and all the fluke in the length of the anchor, and then bending them to the form required; and should the bars of iron employed not be long enough they are to be joined by welding, and the several welds are to be separated from each other in the number of bars that are sufficient to make the size required." The several bars which thus constitute

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* Mr. George Hawkes, Surveyor of Shipping, No. 9, Lucas Place, Commercial Road.

one half of the shank, and the whole of a fluke, Mr. Hawkes proposes to unite by welding only the exterior surface, the interior being as a bundle of distinct rods bound together; thus proceeding upon the well ascertained fact, that a number of small rods or wires bound together possess a greater tenacity than if the same were united into a single solid piece of metal; and in the bending of the iron to form the fluke, it undergoes a greater trial of its strength, than it can ever afterwards experience.

This method of making the anchor in separate parts, admits of the forming of a groove up the middle of the shank for a chain to pass through; and of an eye of great strength for the reception of a wooden stock which is also made in two pieces, and passed into the stock in reverse directions; these having iron shoulders which abut against the eye, are kept immoveably in that position by being braced together with an iron hoop at each end.

Anchors are thus made in parts, which, when put together and braced with strong hoops or rings, form two, three, or four fluked anchors. For the sake of clearness in the representation we have given an engraving of one only at present, which is the common two-fluked anchor; but we shall probably, in our subsequent numbers, give another engraving on the subject.

Description of the Engraving.—*a* the cable ring: *b* the eye which holds the stock, made out of the whole substance of the shank by bending each of the halves into a semicircle in opposite directions. The anchor is shewn to be divided into two equal parts by a line which passes down the middle of the shank, as at *o o*. *c* the wooden stock made also in two equal parts (as before described) and firmly secured in their places by the hoops and shoulders. *d d d d* are four strong hoops which bind the shank together, the upper one is made square, and the others circular. At *e* a portion of the shank is supposed to be removed to exhibit the situation of the chain which passes up the centre, is connected at the upper end to the cable ring, and at the lower end to the buoy ring. *f* (in a separate figure) gives a transverse section of the shank of the anchor, shewing it to be of an oval form, the longest diameter of which is in a line with the flukes, this figure conferring upon it great strength to withstand the powerful strains which an anchor frequently receives in that direction. *h h* are the palms bolted to their respective flukes, each of which are connected in one piece with a brace *i i* that pass in opposite directions round the shank of the anchor, thereby strengthening the flukes in a great degree, and giving a collateral support to each half of the anchor. *k* is a strong plate of iron bolted on to the crown, *l* the buoy ring.

In addition to the observations already made in the preceding description, it is not unworthy of notice that this method of constructing anchors admits of a stock being made much smaller than usual, while it possesses at the same time superior strength; thus a saving is made in timber, a saving in the useful room of a ship, and a gain in superior convenience as well as strength. This construction will likewise render it unnecessary for a ship to take out spare anchors, which with their immense stocks take up so much room, an-

add such a weight to the fore part of the vessel. The Patent Anchors when their parts are separated, lie together so compactly as not to occupy more than one-third of the room usually taken up, and they may be put together when required with the greatest ease and celerity. These are advantages of an unquestionable nature, but they sink into insignificance when compared with the doing away with that uncertain and deceptive practice of welding large masses of iron like the crowns of anchors, where, notwithstanding the superior thickness, they are usually found to break.

CLELAND'S PATENT APPARATUS FOR CRYSTALLIZING SUGAR, &c.

In the 26th Number of this Work an account is given of the ordinary process employed in the manufacture of sugar from the expressed juice of the cane; to which we have now to add a description of a very recent patented improvement by Mr. William Cleland, of Leadenhall Street.

After the saccharine liquor has been brought to that consistency in the *teach* as to crystallize readily, instead of running it into hogsheads, where the molasses are suffered to drain through the crystallized mass, and pass off through holes made in the bottoms of the casks, Mr. Cleland's method is to run the liquor into long narrow linen bags, wherein the sugar being more readily freed from molasses, (which also passes off in greater quantity) permits it to crystallize more perfectly; producing thereby a raw sugar of a more refined and valuable quality than can be obtained when the crystallization is performed in such large vessels as hogsheads.

Mr. Cleland's apparatus may be described as consisting of broad wooden troughs or reservoirs, only four or five inches deep; the bottoms of these troughs are perforated with a considerable number of circular holes, of a conical figure; that is to say, the upper parts of the holes are about two inches diameter, and the lower, one inch and a half: the holes are thus made to fit and receive the necks of the long suspended bags, which admits of their being easily removed when required. The bags are made of that kind of linen called English duck, are of a cylindrical form, three inches diameter, and six feet long, with necks (of the dimensions before-mentioned) made of woollen cloth, the circular figure of which is preserved by a metallic collar, or casing; altogether much resembling in figure apothecaries' phials, excepting that the bags are of greater length in proportion.

The bags, which are made with their lower ends open, are there securely tied with string, and placed in the several holes suspended by their necks, when the liquor from the teach is admitted into the trough, gradually filling all the bags; the crystallizable portion speedily forming itself into sugar, while the molasses percolating throughout the mass, passes through the interstices of the linen bag in all directions, and drops into receivers placed beneath them for that purpose. When the draining is considered complete, the re-

ceivers are removed, the lower ends of the bags untied, when they deliver their sugar into other recipients placed beneath them for that purpose. If necessary the bags may be lifted out of the troughs by their necks, and their contents removed by turning them inside out.

POPE'S PATENT METALLIC SHEATHING.

Mr. Christopher Pope, of Bristol, has taken out a Patent, for the manufacture of metallic plates of a peculiar alloy, suited for sheathing the bottoms of ships, the roofs of houses, and for other purposes to which the same may be applicable. The metals employed are less expensive than those used by Mr. Mushet in his patent composition,* but which of the alloys will best answer the purpose intended is a question which we presume remains to be tried. As the specification of Mr. Pope's patent is concise, we shall annex his own account of the process as therein described.

"I the said Christopher Pope do hereby declare the nature of my said invention to be the covering of ships' bottoms, roofs of houses, or other like things exposed to the action of sea water, of the air or of the weather generally, with thin plates or sheathing, composed of *tin and zinc*, or of *tin, lead, and zinc* united; as also the manner of causing the said union and forming the said plates by the following description.

"To unite tin and zinc, I take a certain quantity of zinc, as it is usually made, and melt it in the usual manner, in an iron pot or other utensil, and when melted I add an equal quantity of tin, and having stirred them together in a fluid state, I cast cakes of it in moulds of about 8 inches broad, 10 inches long, and ¾ of an inch thick; which cakes are afterwards rolled or hammered out into the said plates or sheathing, as I shall hereafter describe.

"To unite tin, lead, and zinc, I melt a certain quantity of lead, in the ordinary manner, and add to it twice the quantity of tin. This composition I cast into small lumps, of any convenient size, and having melted three times as much zinc as I had previously melted of lead in the usual manner, I then add the small lumps of tin and lead, and melt the whole together, which method I find to be the best. In order thoroughly to incorporate the lead with the zinc of this composition, I also cast cakes of the size hereinbefore described; which cakes I afterwards roll or hammer out into the said plates or sheathing, as hereafter described.

"In melting the various metals, care should be taken that no more heat be used than will just suffice to cause them to unite and compound thoroughly, as when made hotter the metal is hardened. The cakes of compound metal having been cast as aforesaid, are then to be rolled or hammered out into plates or sheathing. When rolled or hammered out, the process is the same as that used in rolling

* A description of Mr. Mushet's Patent Sheathing (being the substance of the specification) is given at page 99, vol. 2d of this work.

or hammering out copper; but if the cakes are warmed to the heat of boiling water, they will roll or hammer softer than when cold."

The specification proceeds to state that the precise proportions given are not essentially necessary, and that they may be varied according to circumstances, and the prices of the component metals; and that the size of the cakes and the method of forming them into sheets, are not matters of importance. The patentee claims as his invention the manufacturing of sheathing or metallic plates of the peculiar alloys described, and the employing of them for the purpose of covering the bottoms of ships, roofs of houses, &c.

DICKENSON'S APPARATUS FOR CLEARING BEER WHEN IN A STATE OF FERMENTATION.

The brightness of malt liquor depends much on the accuracy with which the yeast produced by fermentation is separated; and the usual method of effecting this is the following:

The wort, after being duly boiled with the proper quantity of hops, is transferred into coolers, and, when its temperature has thereby been sufficiently lowered, it is removed to a large vessel called the gyle-tub, either open, or fitted with a moveable cover. Here, after being mixed with yeast, it undergoes the first fermentation. The half-fermented liquor is then put into barrels, lying on their sides, with the bung-hole uppermost; out of which the yeast is continually discharging itself, till the fermentation has ceased, or nearly so. During this time, the barrels are examined once, twice, or oftener in the day, and are filled up with fresh liquor, in proportion as the yeast works off, so that the barrels shall be always full, in order that the yeast, as soon as it rises to the surface of the liquor, shall flow off entirely.

Mr. Dickenson has, however, succeeded by the invention of a very simple apparatus to conduct the whole of the fermentation in the barrel in which the beer is stored, and at the same time to provide for the escape of the yeast, without the constant attention and expense of filling up, as constantly practised.

For this purpose Mr. Dickenson places the barrels *upright*; and having filled them with the wort previously boiled and cooled, and mixed with the proper quantity of yeast, he adapts to each barrel the following apparatus:

A small tub with a wooden cover, about the size of a peck measure, is provided, in the centre of which is fixed an open pewter pipe, in a vertical position. This pipe passes through the bottom of the tub, with three or four inches extending beyond the bottom, and the upper end reaching in height to nearly the top of the tub. A tub so prepared, is fixed to each cask containing the liquor under fermentation, in the following manner. A hole is bored in the centre of the head of the cask, into this hole the lower end of the pipe before-mentioned (which is attached to each tub) is made to enter, and is there securely fixed by packing with paper, and to prevent it being thrust in

too far, and to give it stability, each pipe near the lower extremity is provided with a rim or flanch. Into the tub is put liquor of the same kind as that with which the barrel is filled, except that it is not previously mixed with yeast; the quantity of the liquor (about one-twelfth) is such as will be rather more than sufficient to supply the loss in the barrel in consequence of the fermentation. As soon as this process begins, the yeast, rising to the surface of the liquor in the barrel, passes through the bung-hole into the pewter pipe, and flows out of the upper end of it into the tub, the lighter particles in the shape of froth floating on the surface of the liquor, and the heavier ones subsiding to the bottom. The vacuity occasioned by the separation of the yeast is continually supplied from the clear liquor in the tub, by flowing through a small hole made in the side of the vertical pipe.

It is the opinion of Mr. Dickenson, that by the adoption of the above described apparatus, he saves about one and a half per cent. in quantity, and that the quality of the liquor is likewise considerably improved, besides avoiding the use of the gyle-tun, and the expense and loss of transferring the liquor therefrom to the barrel, and the loss of liquor in filling up according to the usual mode.

For a communication of this very desirable improvement in the process of brewing, Mr. Dickenson has been presented with the large Silver Medal of the Society of Arts.

ETCHING UPON STEEL PLATES,

Caution Respecting an Explosive Mixture.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"In one of the numbers of the Register of Arts I observed a method for biting-in (as it is termed) steel plates; the mixture for which is four parts of acetic or pyroligneous acid, one of nitric, and one of spirits of wine. I observed the proportions, but used distilled vinegar, or acetic acid, nitric acid, and spirits of wine.

"With this mixture I bit in my plate; about a week after I re-bit it with the same mixture, and observed a considerable decrease in the quantity; a third time I intended using it, about the same time having elapsed as previously, when I held the bottle up to examine how much it had decreased, it exploded with a stunning report.

"I would feel obliged by some of your scientific correspondents developing the cause. I should imagine it to be either æther or hydrogen gas generated from the dissolved steel. It may act as a caution to those in the habit of using the mixture not to leave the bottles corked.

"Your's, truly,

"G. M. HEATON."

SEA ALARUM.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"HAVING read in a late Number of your REGISTER a letter from 'A Land Lubber, proposing the adoption of some means 'by which it might be readily discovered when a ship is leaking, and 'to arouse the whole crew,'—the following very simple plan suggested itself to me, which, if you should deem it worthy a place in your Register, by inserting in an early number, you will very much oblige

"Your contant Reader and Subscriber,

"*February* 17*th*, 1825. "JUVENIS."

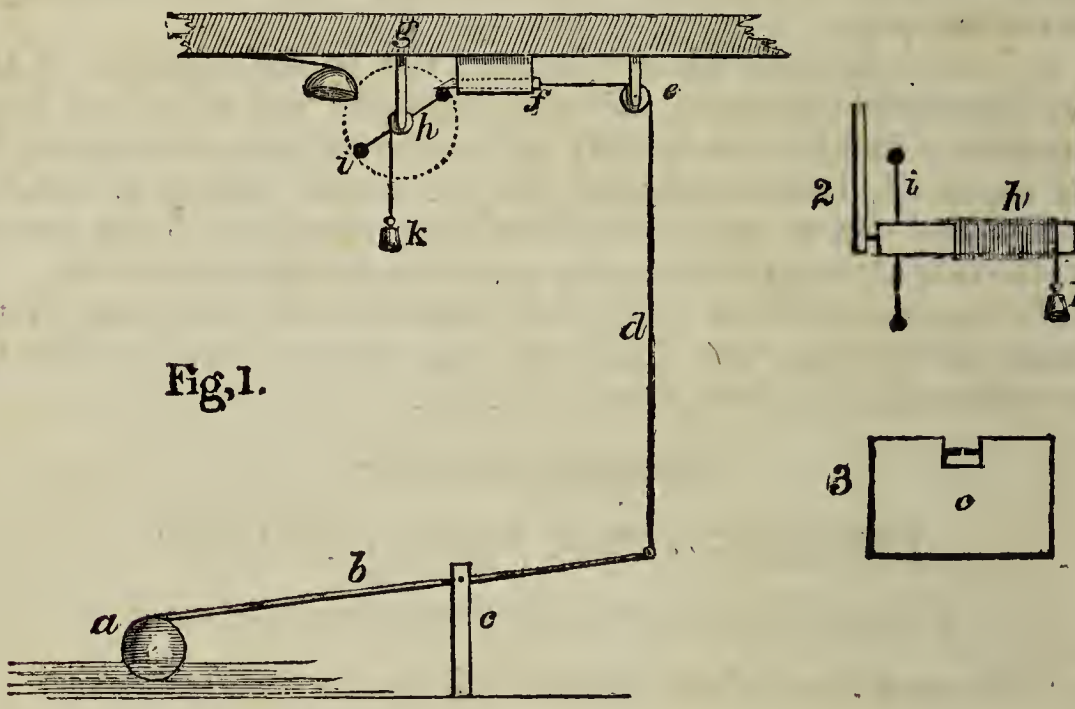


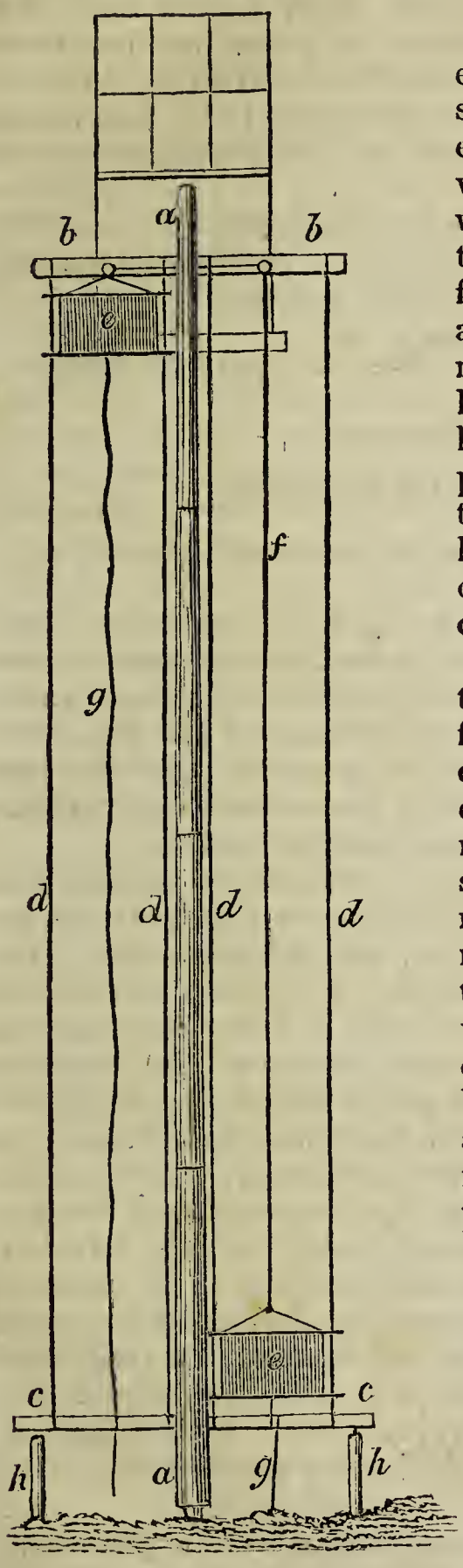
Fig. 1.

Suppose *a* to be a globe of thin copper attached to the iron rod *b*, which is fixed by means of a pivot to the board *c*, which is to be fastened uprightly to the bottom of the vessel; a thin cord *d* is attached to the end of the rod *b*, and passes over the pulley *e*, is tied to the chisel-shaped piece of wood *f*, being laid within a case, which, together with the pulley, the roller and the bell are affixed by means of iron staples to the beam *g*; *h* is a roller so formed as to turn freely on its axis, near one end an iron wire passes through, having at each end a small ball, *i*, thus forming a hammer, which, when turned round by means of the weight *k*, and which is attached to a cord winding round the roller, strikes the dome-shaped bell, *l*. Thus it is evident, that should water find its way into the vessel, the ball, *a*, being lighter than the water will ascend, and thus pulling down the cord *d* will remove the stop *f*, which is first so placed as to prevent the hammers turning round as in the section, the weight will immediately cause the roller to turn round swiftly, thus striking the bell, which is fixed by a kind of spring, that it may not prevent the course of the hammers. *Fig* 2 is an end view of the same; the same letters answer to the same.

IMPROVED FIRE ESCAPE.

" To the Editor of the Register of the Arts and Sciences, &c.

" Sir,



" The late fires have naturally enough led people's attention to the subject of providing some means of escape in case of such accidents. Upon visiting the Adelphi the other day, I was struck with the complicatedness of the several descriptions of apparatus for that purpose, preserved there; and on turning my attention to the matter, I thought that the following humble invention of my own was perhaps an improvement, at least in simplicity, on those now in use. I have therefore ventured to send it to you, hoping that you will think it worthy of insertion in your interesting publication.

a a represents a pole of a suitable thickness, and supposed to be about 40 feet long; it is composed of four pieces each about 10 feet long, and connected firmly together by what are commonly termed mortice and tenon joints, so that a series of two, three, four, or more pieces may be expeditiously (almost instantaneously) fitted one into the other: *b b* and *c c* are two transverse pieces at the top and the bottom of the pole; and are affixed to it by being passed through strong staples at the back of the pole: *d d d d* are four ropes, which serve the double purpose of bracing the several parts of the apparatus together and as guide lines for the two escapement cradles, *e e*, to glide upon. These cradles may be made of canvas (or other suitable materials), with a frame-work of iron; to the upper and lower parts of the sides of each cradle are fixed strong rings of metal, through which the ropes *d d d d* pass, and on which the cradles glide or travel, preventing them thereby from turning on one side or upsetting. The cradles being connected together by the rope *f*, either of them in its descent draws up

the other; and as the ascending cradle would in general be empty, and therefore too light too counterpoise the descending laden cradle, a rope is attached to the bottom of each, one of which (the ascending one) is to be held by a person below. To prevent the whole apparatus from inclining on either side, two pieces of wood, *h h*, like those used for supporting the shafts of a cart, are put under each end of the transverse bar *c c*; this last addition is, however, perhaps unnecessary. The upper end of the pole serves as a handle and support to assist persons in getting out of the window into the cradles.

"The extreme simplicity of the whole apparatus, the expedition with which it may be brought into use, and its general effectiveness, will, I hope, induce you to give the subject insertion.

"Your's, &c.

"ADOLESCENS."

VAUGHAN'S STEAM ENGINE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"HAVING recently perused your interesting Publication, I was much gratified to see that it contained a correct account of my townsman's (Mr. Vaughan's) truly valuable invention; and as objections thereto have been started by theorists, I feel pleasure in being able to answer them, by reference to certain *facts* that have accidentally fallen under my observation; facts which any person may be fully satisfied of, who may choose to take the trouble.

"About ten days since, an engine, of two-horses'-power, constructed upon Messrs. Vaughan and Son's patent principle, was put to work on the premises of a Mr. Bew, near the gas-works of this town. The cylinder of this engine is only five inches in diameter, and the work it is now doing is as follows; it drives *seven stones* in the grinding of glass, and *six buffers* and *glazers*, at which there are thirteen men employed. Now it will not be disputed by any person acquainted with these operations that a less power than that of two horses is sufficient to drive the apparatus mentioned; and it is calculated that an engine upon Bolton and Watt's principle, of the most improved construction with a five-inch cylinder, is only 8-10ths of one-horse power. How then is this vast difference to be accounted for, unless it be admitted that the atmospheric pressure does really (as stated by Mr. Vaughan) operate simultaneously in conjunction with the steam, or as you have expressed it, with their forces united? The work done by this engine and that of others in the neighbourhood, is rapidly dissipating the prejudices that too frequently check the progress of useful discoveries.

"The engine at Mr. Bew's makes one hundred strokes per minute; it consumes only half the quantity of steam, and forty per cent. less of coals, than any other engine executing the same quantity of work.

"Your obedient Servant,

"*Sheffield, 26th Feb,* 1825. "VERITAS."

BROWN'S GAS VACUUM ENGINE.

After all the conflicting reports which have gone abroad concerning this Engine it is exceedingly satisfactory to find that those who have most doubted its practicability are at length gradually removing the doctrines and difficulties which they themselves endeavoured to establish. We happen to know that the view now taken of Mr. Brown's invention is precisely that which was all along entertained by the gentleman who projected the Gas Engine Carriage Company, and we think that great credit is due to the *Scotsman*, after the objections which it at first so sturdily maintained, by coming forward so handsomely to make the *amende honorable*. We have great pleasure, therefore, in giving the following statement all the publicity in our power.

"A very ingenious paper on this engine appeared lately in a contemporary paper; and on Wednesday night Dr. Fyffe made some interesting remarks on the same subject, at the close of his lecture in the school of arts, of which we wish to take some notice. Before proceeding farther, we may remark that Mr. Brown's engine has made us acquainted with a fact, which we believe was scarcely known before—the extraordinary rarefaction produced by the sudden combustion of a quantity of gas in a mass of common air. It is upon this, and not upon a condensation of a part of the gaseous fluids, that the power of Mr. Brown's engine chiefly depends; and till the engine itself was exhibited, it was not, we believe, suspected that the momentary effect of the heat evolved in dilating the aerial mass was one third part what it is actually found to be.

"The writer in the *Mercury* states that, by mixing one part of coal gas with seven of common air, a vacuum equal nearly to five parts was produced, the residuary air occupying three parts of the glass vessel; and this proportion of one part of gas to seven of common air was found to be most advantageous. When oil gas, however, was employed, one part of the gas added to twenty of common air was found the most advantageous, and the vacuum formed amounted to ten parts. In the first set of experiments, therefore, one foot of coal gas afforded five of vacuum, and in the second one foot of oil gas afforded ten. We may add, that we saw the experiments with the coal gas performed; and that we have the fullest confidence in the accuracy and skill of the experimentor.

"Dr. Fyffe conducted his experiments pretty nearly in the same way, but arrived at results considerably different. He stated, that after many trials he found that the greatest effect was produced when one part of coal gas was mixed with thirty of common air; and that he had sometimes obtained a vacuum equal to twenty-four parts, though on account of the nicety of the operations it was often much less. He repeated the experiment with 1-30th of gas several times in the presence of the class, and the vacuum obtained varied from fifteen to twenty-one parts—the whole contents of the glass being thirty. The doctor considers the vacuum as produced almost entirely by the sudden dilatation of the air; and he has no doubt that with

apparatus properly contrived a vacuum equal to twenty-four or twenty-five parts, that is 4-5ths and 5-6ths of the contents of the cylinder, might be constantly obtained. He added, that he has since learned that 1-30th of gas is the quantity actually used by the patentees in London, and that the vacuum produced is nearly what he stated.

"We think a person a little acquainted with chemistry will not consider the discrepancy between the two sets of experiments unaccountable. As the oil gas gave a result twice as great as the coal gas in the first set of experiments, it is quite plain that one quality of coal gas may give a greater result than another, and that a part of the discrepancy between Dr. Fyffe's experiments and the others may arise from the varying purity, or rather the *varying strength*, of the gas employed. In the next place, to obtain the *maximum* of a vacuum a critical moment must be seized, which requires great nicety of manipulation, and it may happen, that the circumstances under which the experiment is performed, may be more favourable for this purpose in one case than in another. In the third place, Dr. Fyffe thinks that the smallness of the volume of the aerial fluids used in the other experiments was partly the cause of the smaller amount of vacuum obtained, because in this case a greater proportion of the heat is wasted on the glass vessel, and the rarefaction will be less. On these grounds collectively, and taking into account, Dr. Fyffe's acknowledged skill and experience in the science, we see no reason to doubt that in an engine constructed with care, one foot of gas may afford twenty-four feet of vacuum. This may be received as a fundamental fact in estimating the powers of the Pneumatic Engine. After seeing the experiment repeatedly made, too, we concur in the justice of Dr. Fyffe's remark, that the term *explosion*, in the usual sense, is not properly applicable to the process; it is merely a rapid combustion, but unaccompanied with the noise and dangerous violence, which that term familiarly suggests.

"The price of coal gas in Edinburgh is 12*s*. per 1000 cubic feet in shops. But this price covers the great expense of pipes, the loss from leakage, and the profit of the manufacturer. Dr. Fyffe stated that the prime cost of the gas was 4*s*. 11*d*. per 1000 cubic feet of gas, but that gas sufficiently good for working an engine, extracted from a cheaper coal and purified by a less expensive process, might be furnished at 2*s*. 9*d*. or, taking a round sum, at 3*s*. Now, assuming the 24 feet of steam per minute afforded a power equal to that of one horse, one foot of gas, yielding 24 of vacuum, should produce the same effect. Hence a pneumatic engine of one-horse power should consume 60 cubic feet per hour, or, in round numbers, 1500 cubic feet per day, the cost of which, at the price mentioned, would be 4*s*. 6*d*. It follows from the statements of the writer in the *Mercury*, which we believe to be substantially correct, that this expense, though moderate, would be considerably greater than the expense of steam. But still, if by the additional cost we could get rid of the vast and cumbrous machinery of the steam engine, there are cases where it would be highly advantageous.

"Assuming, as previously stated, that 60 cubic feet per hour are

equal to a horse power, it follows that 1000 cubic feet would supply a four-horse power engine for four hours. Now, since 30 atmospheres of gas can be compressed into the bulk of one, it follows that a cubical copper vessel, scarcely exceeding one yard each way, would hold the quantity of gas required to work the engine for four hours. The engine itself is said to weigh only one-fifth part of the steam engine. One of four-horse power might consequently weigh something less than a ton, while the locomotive steam engine of the same power weighs four tons. Were engines of this description, therefore, adapted to locomotive machines, a four hours', or even a six hours' supply of gas could be stowed into the machine, and all the bulky apparatus for manufacturing the gas, with the fuel, and part of the attendance, could be dispensed with. The extra price of the gas compared with steam, (and compressed gas would cost more than gas of ordinary densities) sinks into nothing in a case of this kind, where every ton of stowage gained may be worth ten shillings or twenty shillings per day, If the machine fulfils the promise of its inventor, its value for purposes of this kind will, beyond a doubt, be very great. We have, however, been so often disappointed in mechanical inventions, that we wish the statements we have given to be received as hypothetical, till Mr. Brown's engine is made for sale, and fairly in operation in other hands than his own. Admitting that there is no deception in the principle, there may be great drawbacks on its working powers in the mechanism for giving the principle effect.

"We have been informed that Mr. Brown has received a large sum for the patent right of applying his engine to the propulsion of carriages upou common roads, and that it is seriously intended to apply it to *work the plough*. This, indeed, will be a wonderous achievement. We have only to go a step farther, and get a gas machine to guide the plough—a pneumatic ploughman; and then the result which Godwin anticipates will be realized—when the plough will be turned into the field without a hand to hold it."—*The Scotsman.*

PROVINCIAL PORTABLE GAS COMPANY.

We have great pleasure in stating that the success which has uniformly attended the introduction of gas in a portable form, has induced a body of individuals of the highest respectability in the city to establish a company upon the plan of the London Portable Gas Company, for the purpose of diffusing that species of illumination throughout the provincial towns of the united Kingdom. The avidity with which the shares were bought up may be regarded as a pretty sure indication of the *feeling* entertained of the safety and success of an establishment of this nature. We have been given to understand that at no time since the formation of the London Company has it been able to meet the demand for gas, and that applications have continued so rapidly to augment, that they have never ventured to *advertise* although their works have been greatly extended. The establishment of the Provincial Company has been very recent, and already have several

cities and towns come forward with funds actually subscribed for the purpose of co-operating with the parent company, for the erection of local establishments. We are not aware that the shares are yet arrived at many hundreds of pounds premium, but we have no doubt that Portable Gas will be illuminating the world when half the *El Dorado* schemes at present a-foot are quietly reposing in the unfathomable vaults of the south-sea.

We are induced to notice this subject for three reasons, first, that it is really a solitary instance of a scientific discovery being so easily rendered certainly applicable to the useful purposes of life; secondly, that it was our own peculiar first-born; and thirdly, that for these two reasons we heartily wish it that success which it needs no wish of ours to ensure.

PREPARATION FOR THE DESTRUCTION OF VERMIN, AND FOR THE PICKLING OF SEED-CORN.

By Mr. William Pope, of Gartymore, near Helmsdale, County of Sutherland.

Hitherto it would appear that no effectual remedy has been discovered to check the destructive ravages of the grub and caterpillar vermin, which, in orchards and kitchen-gardens, occasion so much loss to the industrious gardener. The following preparation is therefore humbly recommended as a valuable remedy to vanquish, if not entirely to exterminate, all the tribe of vermin that prove so injurious to the industry of those who cultivate the soil.

Take tobacco leaves, cut them small, and make a strong infusion of them in hot water poured upon them in a large tub. The infusion must not be boiled, as that would carry off in vapour a great portion of the most valuable principle, the essential oil of the tobacco. When this infusion is cold, dissolve in it one or two pounds of common gum-arabic; when the gum-arabic is dissolved, a pound or more of flour of sulphur may be added, particularly if the infusion is intended to give a smart washing to wall fruit-trees.

It is conceived that the month of January, if the weather is soft, is the best season for the application of this infusion to wall fruit-trees, and to all kinds of gooseberry and currant bushes, previously pruning all bushes, and weeding clean round the stems. Some days after the first washing with a watering-pot, or garden-engine, it would be beneficial to prepare a portion of the infusion with an additional quantity of the gum-arabic, to be applied with a brush to the stems of the bushes, at least for a foot or more above the ground. The atmosphere will generally keep the gum moist; and any vermin that may rise from the earth, in the course of the spring, will be arrested by the gum, and the tobacco will kill them effectually. There is one species of grub that never quits the ground till it becomes a kind of butterfly. This species destroys cabbages and cauliflowers, by attacking the roots about an inch under the surface of the earth. It would therefore be proper, before these vegetables are hoed up, to

give a small portion of the infusion to each plant from a tin tea kettle. And it is further recommended, when these plants are taken up to be transplanted, that their roots should be put in the infusion for a few minutes before they are dibbled into the earth. It is wonderful how much this infusion promotes the vigour of vegetation, where it gets to the roots of any plant.

Vipers, which are common in gardens in England, and the south of Scotland, will soon forsake gardens in which the said infusion is used freely; and the essential oil of tobacco, if applied to the mouth of a viper, upon the tip of a small rod, till it bites at the rod, will kill the reptile to a certainty. This oil will kill the most poisonous snakes of warm climates.

The tobacco-leaf yields a considerable quantity of essential oil, which is readily obtained by smoaking tobacco in a tube nipple-glass. The oil will condense in the bulb of the nipple-glass; and it is so extremely caustic, that it will destroy the epidermis where it touches the human skin.

It is peculiarly gratifying to observe, that the said infusion with gum-arabic,* and flour-of-sulphur will be found a most important article to the farmer in the pickling of wheat or barley seed; and it is not necessary that the grain should be in the liquor above half an hour. The grain should be put in the infusion in large tubs; and when taken up, put into bags, and the bags to be suspended over the tubs until the infusion is entirely drained off. As soon as the liquor is entirely drained off, let the seed corn be spread upon canvas-sheets in the sun and air, if dry weather; but otherwise on the sheets on the barn floor. When spread upon the sheets in the quantity of four bushels, sprinkle over it two pounds of fine flour-of-sulphur, and rake the seed over and over again, to separate the grains. If the grains appear still to adhere to each other, it will be proper to add a little fine sand to make them separate freely for sowing. The destructive ground-grub will not readily attack any seed pickled with this infusion, and the spring it gives to vegetation is astonishing.—*Transactions of the Highland Horticultural Society.*

REMEDY FOR THE PERNICIOUS EFFECTS OF BURNING CHARCOAL IN CLOSE ROOMS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"EVERY body, I fancy, has heard of the pernicious effects of burning charcoal in a close room: few, perhaps, have heard that by sprinkling a small quantity of salt over the charcoal the evil

* The principal use of the gum-arabic is to carry the flour-of-sulphur into the soil attached to the seed.

[It would perhaps be good economy to employ the common gums that exude from the cherry and plum trees of the garden, which would answer every purpose of the gum-arabic, if used in rather an increased quantity. The root of the common blue-bell, dried and powdered, affords also a mucilage possessing the same properties as that from gum arabic.]—EDIT.

is removed. Perhaps some of your chemical correspondents would favour me with the reason why ignited charcoal is so dangerous, and why salt remedies it. "I have the honour to be, &c.

"J. H. H."

RECENT PATENTS.

BRICK-MAKING.—To Edward Lees, and George Harrison, of Little Thurrock, Essex, for a new and improved method of making bricks, tiles, and other articles manufactured with brick-earth.—Sealed 1st February, 1825.

ROASTING JACK.—To John Thin, Esq. of Edinburgh, architect, for a new method of constructing a roasting jack.—Sealed February 1st. 1825.

LIQUID METER.—To Samuel Crossley, of Cottage Lane, City Road, London, for certain apparatus for measuring and registering the quantity of liquids passing from one place to another.—Sealed February 1st, 1825.

GAS REGULATORS.—To Samuel Crossley, (as above-mentioned) for an improvement in the construction of gas-regulators, or governors.—Sealed February 1st, 1825.

LOCOMOTIVE STEAM CARRIAGE.—To Thomas Burstall, of Bankside, Southwark, and John Hill, of Greenwich, Kent, engineers, for a locomotive, or steam-carriage, for the conveyance of mails, passengers, and goods.—Sealed February 3rd, 1825.

COMPOSITION OF MALT AND HOPS.—To Dr. G. A. Lamb, of Rye, Sussex, for a new composition of malt and hops.—Sealed February 10th, 1825.

SPINNING.—To Richard Badnall, jun. of Leek, Staffordshire, for certain improvements in winding, spinning, throwing, &c.—Sealed February 10th, 1825.

WEAVING.—To John Heathcoat, of Tiverton, Devon, for improvements in the manufacturing of silk.—Sealed February 11th, 1825.

WATER WORKS.—To Edward Lees, of Little Thurrock, Essex, for certain improvements in raising and conveying water for flooding or draining lands.—Sealed February 19th, 1825.

TO READERS AND CORRESPONDENTS.

Corrector has been, we think, too hasty in his conclusions. He is quite right when he says that "the rays of heat radiate from the fire," but if he refer to the context he will see that the assertion with which he finds fault is perfectly correct, a fire, according to the present plan of giving artificial warmth, can never diffuse throughout an apartment an *equable* heat, because by far the greater part of the heated air rushes through the chimney as a vent hole; and a person sitting in the midst of the current of *cold* air which supplies the place of the *warmed* (passing up the chimney) must needs find himself in the wrong way. From this it would seem that the *top* of the chimney is the proper situation to obtain artificial warmth!

B. H. G.—We imagine that the Bricklayer employed to erect the furnace flue must have been in an error with regard to the position he has chosen. We know of no means so effectual to expel damp air from a flue, as by burning a little fuel *on the top of it.* A very little ingenuity we imagine could effect this. If, however, B. H. G. wishes us to insert his letter we will do so.

The title page &c. were included in the last number of the first volume.

We are at a loss to conceive what connection the enquiry of B. S. has to do with the *Arts and Sciences.*

The renowned almanack of "Francis Moore, Gentleman," will furnish *Silex* with all the information he requires; and more too.

U. X. Y.—Dubois.—Astre.—Henry.—I. G.—Pheneas.—L. J. H.—and Questus—have been received.

[*To be continued every* FORTNIGHT.]

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REGISTER

OF

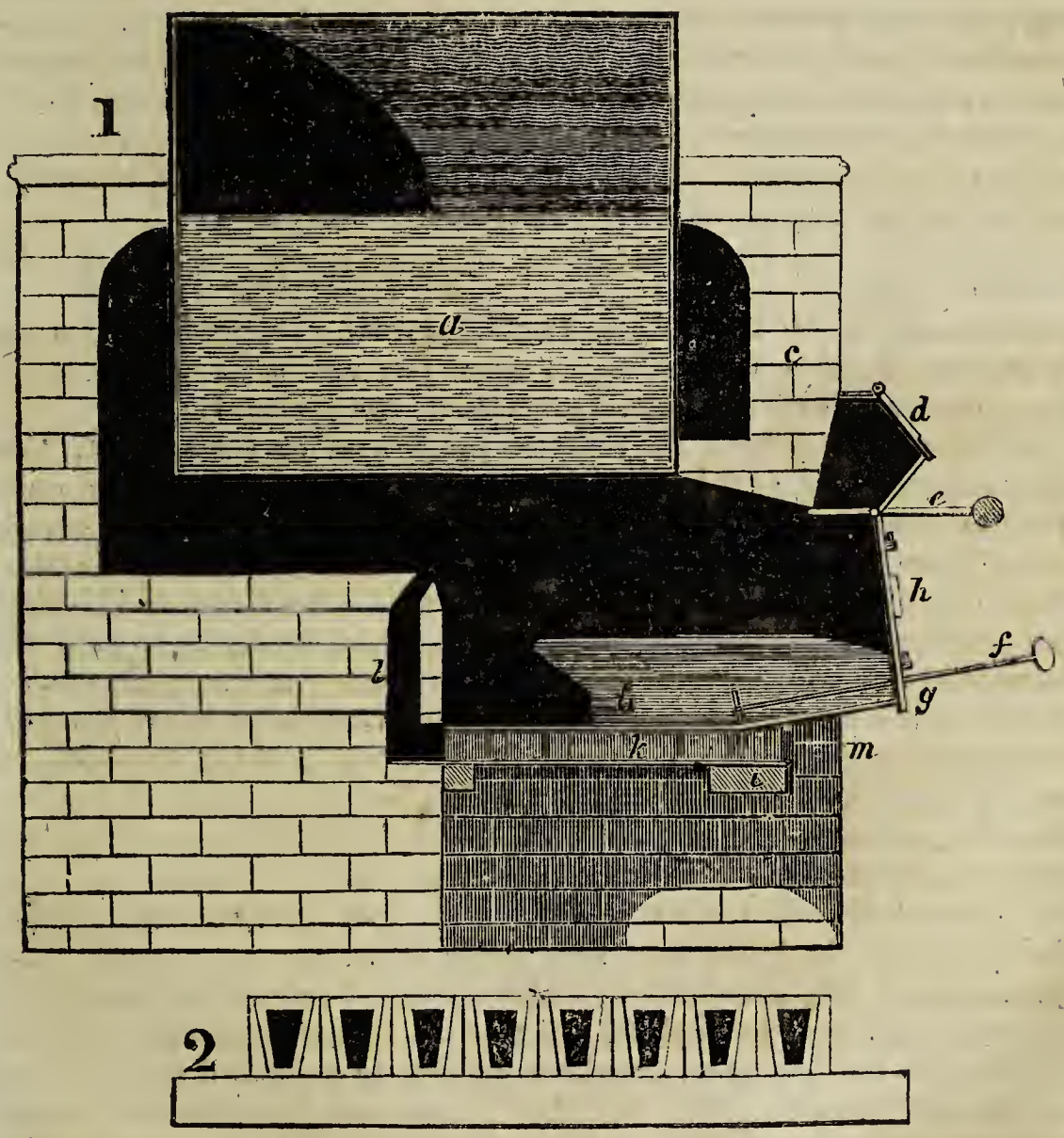
THE ARTS AND SCIENCES.

IMPROVEMENTS AND DISCOVERIES.

No. 39.] SATURDAY, MARCH 19, 1825. [Price 3*d*.

CONTENTS:

Chapman's Plan for consuming the Smoke of Steam-Boilers.. 226
Holland's Patent Shoes & Boots 228
Griffith's Stop-cock for transferring corrosive Gases 229
Hawkes's Patent Anchors..... 230
Spencer's Patent Forge.. ..... ib.
Rotch's Patent Lever Fids..... 233
Mr. Brougham's Pamphlet 236
Encyclopædia of the useful Arts, No. 9 237
Patents, Correspondents, &c. 240



MR. GEORGE CHAPMAN's PLAN FOR CONSUMING THE SMOKE OF STEAM-BOILERS.

MR. GEORGE CHAPMAN's PLAN FOR CONSUMING THE SMOKE OF STEAM-BOILERS.

The dense smoke arising from steam-engine boilers having been long felt as a public nuisance, the Society of Arts have been induced for several years past to offer the premiums of their large gold medal, or fifty guineas, for the discovery of a means for consuming the same. Mr. Chapman, an ingenious iron-founder of Whitby, having in consequence given the subject his best attention, at length discovered, and put into successful practice, a means of attaining this desirable *consume-ation,* as attested by several most respectable eye-witnesses. The invention having, however, been applied only to a two-horse engine, and the Society considering that it might not be equally successful in apparatus of greater dimensions, have voted to Mr. Chapman their large silver medal in lieu of the full premium above stated.

As Mr. Chapman has not, and cannot now take out a patent for his invention, (so well-deserving of one) we have thought it right to mention the above circumstances, in the hope that should any of our readers make the experiment on a great scale, they will not fail to make it known to the Society, in justice to Mr. Chapman for so excellent a contrivance. The following is that gentleman's communication on the subject addressed to Arthur Aiken, Esq.—

"Sir, "*Whitby, Feb.* 4, 1825.

"I beg leave to offer myself as a candidate for the premium offered by the Society of Arts, &c. entitled a more effectual Consumption of Smoke in steam-engines, breweries, &c."

It is well known to all that are conversant on the subject, that it is necessary to admit a portion of pure atmospheric air, to unite with the smoke after it is generated in the furnace, in order to supply the oxygen gas, without which it will not inflame. It is likewise known that any air admitted into the body of the furnace, if it does not go through the burning fuel, has a great tendency to cool the bottom of the boiler, and retard the generation of steam. To obviate this it is the general practice, in the construction of those furnaces which consume the smoke, to admit the air partly at the ash-pit, and partly up through the fire bridge. I offer for the consideration of the Society, an improved plan, which I have adopted, and which has answered beyond my utmost expectations. It is as follows :—

To heat the air before its admission into the furnace. This I do by casting the grate bars hollow from end to end, so that they form a series of parallel tubes, which open into two boxes, one placed in front, and the other behind the grate. In the front box, directly underneath the fire-door, I make a register to open and shut, to any extent, at pleasure. The other end I connect with the brick-work directly under the fire-bridge, which fire-bridge I make double, with a small interval between, say one inch; the interval to go across the furnace from side to side, and rather to incline forward, or towards the fire-door, so as to meet and reverberate the smoke on to the ig-

nited fuel in the grate, which causes it to inflame and become a sheet of bright fire under the bottom of the boiler.

From what I have said you will perceive that if the front register is open, or partially so, there will be a great draught of air through it, along the interior of the grate bars, thence into the flue of the fire-bridge, and out of the orifice at top, which air will be heated in its passage through the bars, before it comes in contact with the smoke, when it will give out its oxygen, and cause it to inflame.

Such was my view of this part of the subject in theory, and I have found it to succeed in practice, in a small engine of my own. But a further improvement was necessary to make it quite perfect. There are few people who are aware of the extent of the mischief arising from the old method of charging a grate by the front door. Now, in my engine (which is only two-horse power) I calculated that every time the fire-door was opened to stir the fire and replenish the fuel, there could not be less than from 45 to 50 cubic feet of cold atmospherical air admitted into the furnace, which so cooled the heated gases, &c. that however complete the plan was in other respects, the smoke could not possibly inflame, from being so cooled, till a considerable time after the fire-door was shut.

To obviate this I have adopted a cast-iron hopper above the fire door, with a type at the bottom that has two pivots at one side, and opens at the other; one pivot goes through the end of the hopper, and has a counter lever to keep the type shut when a sufficient quantity of coal for a charge is on it. The top of the hopper is covered with a lid which I shut down during the time of firing, then, by lifting the lever which opens the type inside, the coals slide down on to the fore end of the grate bars, which is only the work of a moment. It is evident that no quantity of cold air can thus get into the furnace; in fact it is not possible for any person that does not see the operation of firing to know when fresh fuel is added by looking at the top of the chimney. The smoke that issues is never more than a light grey, just perceptible, but in a general way is not seen at all.

The coals last admitted, after lying a short time at the front of the more ignited fuel, become partially coked, and just before I admit a fresh supply, I push the last charge further along the grate, by a tool made for the purpose, which remains constantly in the furnace. It consists of a plate of iron about four inches broad; its length goes across the grate with a round bar of iron rivetted in its centre, at right angles, to form a handle, which comes through a hole made in the bottom of the fire-door, and is long enough for a man to use with both hands, so that he can either push from, or pull towards him, to manage the fire within, without opening the fire-door, except when the grate wants cleaning, &c. &c. For better knowing when the fire wants stirring, or replenishing, I have a hole, about an inch in diameter, in the fire-door to look through, covered by a piece of iron which hangs by a rivet above.

After I have used the above instrument I pull it up close to the fire-door, where it remains till it is again wanted; and the coals, when let into the fire, fall down beyond it.

"The above written account constitutes the whole of my improvements as far as is required by the Society, but not the whole of the advantages gained by my invention. For instance, the *durability of the grate bars* by the admission of air through them. I may add that I examined my own yesterday, and I do not find them any worse although they have been in use since the beginning of October last."

Mr. Chapman concludes his letter by referring the Society to the certificates which accompany the communication of several scientific gentlemen of Whitby, all of the highest respectability, whose attestations confirm the statement of the inventor in every important particular.

Reference to the Engravings.—Fig. 1 is a section of the boiler and furnace, and *fig.* 2 a view of the hollow bars as they open into the box *i*.

a is the boiler, *b* the fire-place, *c* the feeding hopper, with its cover *d*, and its type or turning bottom, with its lever or counterpoise *e*, by means of which the coals are delivered into the fire-place. *f* is a rake, by means of which the half-burnt coals are pushed forwards previously to letting in a fresh charge; *g* a slit below the furnace-door, through which the shaft of the rake passes; *h* an eye-hole in the furnace-door, through which the state of the fire is seen; *i i* an air-tight box into the back of which the bars open, and in front of which is a register for the admission of air; *k* one of the hollow bars, the whole of which are shewn in *fig.* 2, as they open into the box *i* above-mentioned; *l* a flue in the fire bridge, through which the air having passed into the box *i*, and thence through the hollow bars *k*, passes into the furnace and consumes the smoke.

HOLLAND'S PATENT SHOES AND BOOTS.

Mr. James Holland, of Aston, Yorkshire, shoemaker, has lately obtained a patent for a novel kind of soles for boots and shoes, which although made wholly or in part of wood (prepared and constructed in a peculiar manner) are stated to be so flexible as not in the least to inconvenience the wearer, to last twice as long as those made in the ordinary manner, and to be finished with equal neatness.

For shoes, the toe part extending to the middle of the sole, and the heel, are of wood; the middle or hollow between those parts is of leather to give *pliability* there; and the leather and wood are connected by screws or rivets. The upper leather, the quarters, and the welts, are made in the usual manner, and stitched with waxed thread, bringing the leather so as to overlap the edges of the soles, and is fastened down by means of nails or screws. To accommodate the natural bending of the fore part of the foot, a slanting cut is made in that direction, severing the wooden part of the sole, which is afterwards connected by a hinge joint.

For boots, the soles are entirely of wood, but divided into three parts, to give sufficient flexibility; the two divisions of which are

connected by means of hinge joints; one of these is in the same situation as that described in the shoe sole, the other is about two inches nearer the heel in a parallel line with the former. The wood may be of any light kind not liable to split; it is prepared by boiling in a solution of lime, and when dry saturating it with oil. The inside of the sole may be lined with cloth soaked in tar to render it waterproof. The upper parts of the boot are made in the ordinary way, the leather of which is brought to overlap the bevilled edges of the soles, and fastened by nails or screws. Iron tips may then be fixed to the toe and heel, and the boot is completed.

MR. GRIFFITHS'S STOP-COCK FOR TRANSFERRING CORROSIVE GASES.

Common brass-cocks, when employed for confining acid or other gases, especially under pressure, soon become corroded so that the plug or key becomes immoveable, and the bore filled up with a salt of copper, the consequent result of a chemical action upon the metal of the instrument. A stop-cock made entirely of glass has also many disadvantages: its size and clumsiness of form, together with the difficulty of uniting it securely to other apparatus, are inconveniences often felt by the experimentalist.

To obviate them, and to offer a method in which stop-cocks of the common form are united with security against the attacks of active chemical agents, is the object of the present communication.

In accurate experiments on the absorption of gases by solid or other bodies, the advantage of having an apparatus not liable to be acted upon by the substances under examination will be readily acknowledged.

Platina is the material best adapted for this purpose, if its high price did not in most cases prohibit its use; most or perhaps all its disadvantages may however be obtained in the method about to be described, and at a comparatively moderate expense.

The invention consists in making a stop-cock of the usual form, but of rather smaller dimensions, and selecting a piece of platina wire of sufficient thickness to allow a hole being drilled through its axis; this operation forms a thin tube of platina which is afterwards accurately fitted into the bore of the brass stop-cock, leaving about one sixteenth of an inch projecting at each end, which is to be opened and extended so as to cover each extremity with a plate of platina. The brass plug or key has a platina tube secured as above described, with the addition of two small discs of platina, placed at right angles to the gas-way or bore; these, together with the platina tube and brass parts of the instrument, are ground down perfectly air tight. It will be obvious from the explanation, that whether the stop-cock be open or closed, platina is opposed to the action of the gas or other agent. In the one case, it protects the gas-way and ends of the instrument; in the other, the small disc of platina prevents corrosion of the plug.

If it were desired to confer security to a moderate extent upon a stop-cock as usually employed, this may easily be effected by taking a glass tube, cutting it to the required length, cementing one portion into the plug, and the other into each end of the bore; if this be carefully done, so as to avoid any fragments of glass falling into the ground parts, it will be found very effectual in preventing corrosion, the gas-way always remaining clear.

While collecting gas in a mercurial gasometer a large body of gas has to pass through the aperture of a stop-cock, which at the same time it rapidly corrodes. If a stop-cock lined with glass be employed in this experiment it will be found to possess many advantages over that in common use, with little additional trouble or expense.

To prove how accurately a glass tube may be fitted into the brass with cement, several instruments constructed in the above manner have had the tubes filled up with nitric acid without any solution of metal taking place.

It should however be remarked that the protection of the instrument is withdrawn when closed, but this is of no great consequence in common experiments. If it is an object to have it protected, in an equal degree, when open or shut, the disc of platina formerly described may be resorted to.—*Transactions of the Society of Arts.*

HAWKES'S PATENT ANCHORS.

In consequence of our spontaneous notice of the above-mentioned interesting invention in our last Number, we have received some explanatory observations from the patentee which we here subjoin.

"Relative to the stock, it may be necessary to say that a first-rate ship's anchor stock on the present system requires a piece of timber to make it *equal or superior* to what will make a *first-rate floor timber*, and so in proportion to the smallest class of ships; and notwithstanding this great consumption of principal timber, (as every ship takes from three to four anchors stocked, and two spare stocks) the strength of the timber is one third destroyed in the scoring it over the anchor, and with the tree-nails and bolts that are necessary to hold it fast independent of the great expense of the hoops, while the anchor stocks, on my patent *principle* will be stronger, of *fir* timber, with the united support of the shoulder plates, and will only require one hook and bolt in each end. If the chain is passed through the anchor, the link in the wake of the stock is made the length of the diameter of it, and the stock can be left open in the middle, or cut a three-quarter of an inch on each half stock. If an iron stock, the link in wake of the stock is made large enough to run the stock through it."

SPENCER'S* PATENT FORGE.

When it is considered that there are not less than 60,000 persons employed in the manufacture of forged iron nails, in the

* Mr. Jos. Spencer, of Belper, near Derby, nail manufacturer.

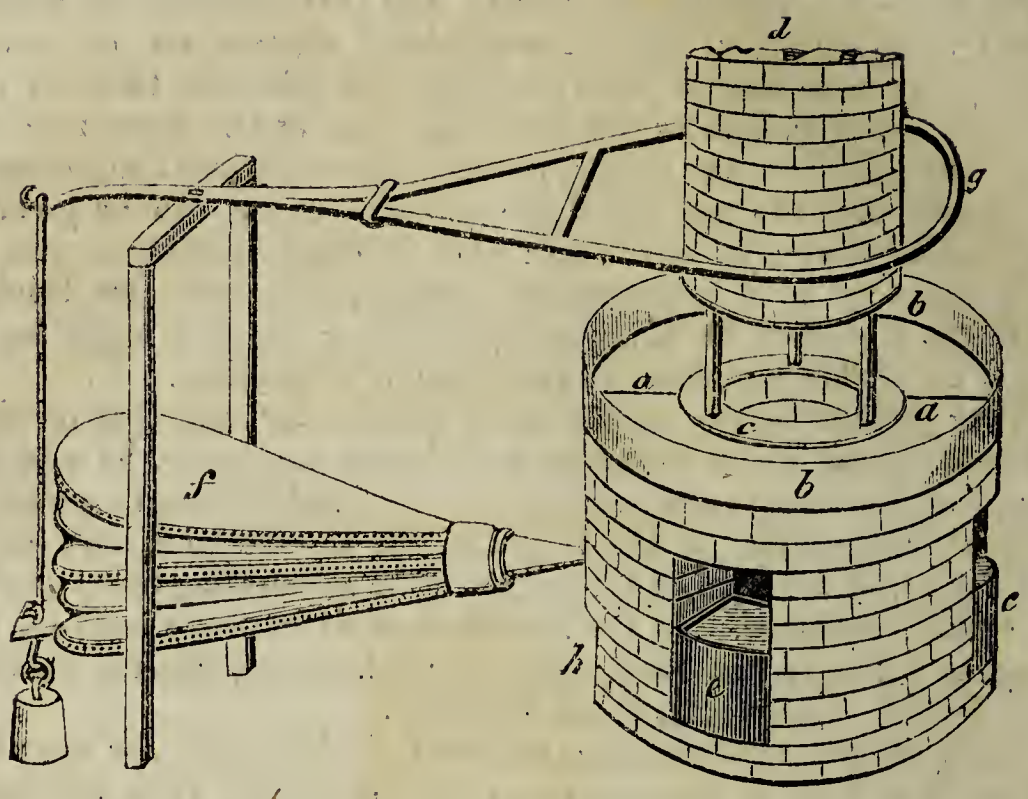
neighbourhood of Birmingham alone; and that a prodigious variety, as well as quantity, of small ironmongery articles are made by a similar process to that of nails; it must be admitted that any new invention which facilitates the operation, and at the same time improves the quality of the goods, is really one of national importance; and as such ought to receive all the publicity which can be given to it by similar works to our own: and although the subject has already appeared in a cotemporary weekly publication, we think it due to the invention to sacrifice every feeling which it might be expected we should entertain on the score of originality.

That peculiar sort of nails used by farriers for fastening on shoes of horses, ought to be extremely ductile and malleable, to admit of their being bent and twisted without breaking, which they frequently do when of bad quality, to the injury of the horse's hoof, and to the perplexity and vexation of the farrier while performing that laborious and skilful operation. In the manufacture of superior nails for that purpose, we have had the opportunity of knowing that the Patentee has acquired, deservedly, much celebrity.

With respect to other kinds of nails (of which there are more than two hundred sorts in common use in this country), their brittleness is an universal complaint. This may easily be accounted for, in the competition of the manufacturers to render the article *cheap*. It is, we believe, generally known or understood, that the toughness and malleability of wrought iron depends chiefly upon a peculiar combination with carbon, subsequently undergoing the processes of hammering, rolling, &c. by which it acquires a close fibrous texture, and an increased flexibility. In making the better kind of iron, called charcoal-iron, a considerable quantity of charcoal is therein used; of this metal, which is expensive, horse-shoe nails, and several other sorts, are or should be made. For other kinds of nails the very commonest and cheapest is generally used, or that which is made by the quickest process; the bars are split into rods, of various sizes to suit different sorts of nails; and the nail makers, to save themselves work, select rods of the full size of the shank of the nails to be made out of them. The consequence is, that that part of the iron constituting the shank of the nails is not improved by the operation of the hammer; the point and the head being all that the workman has to produce; common nails are therefore generally found to break in the shank, or thickest part.

Mr. Spencer's improvements will go far to remedy these serious defects; his forge is peculiarly adapted for the burning of charcoal, and he proposes to adopt this fuel in conjunction with coke, or coal purified from sulphur, generally in the proportion of three parts of the latter to one of the former. These proportions to be, however, varied according to the nature of the coal and the quality of the metal so to be wrought.

The following engraving gives a perspective view of the Patent Forge. The form of it, as therein shewn, is circular, and may be considered to be about four feet in diameter, and three feet in height.

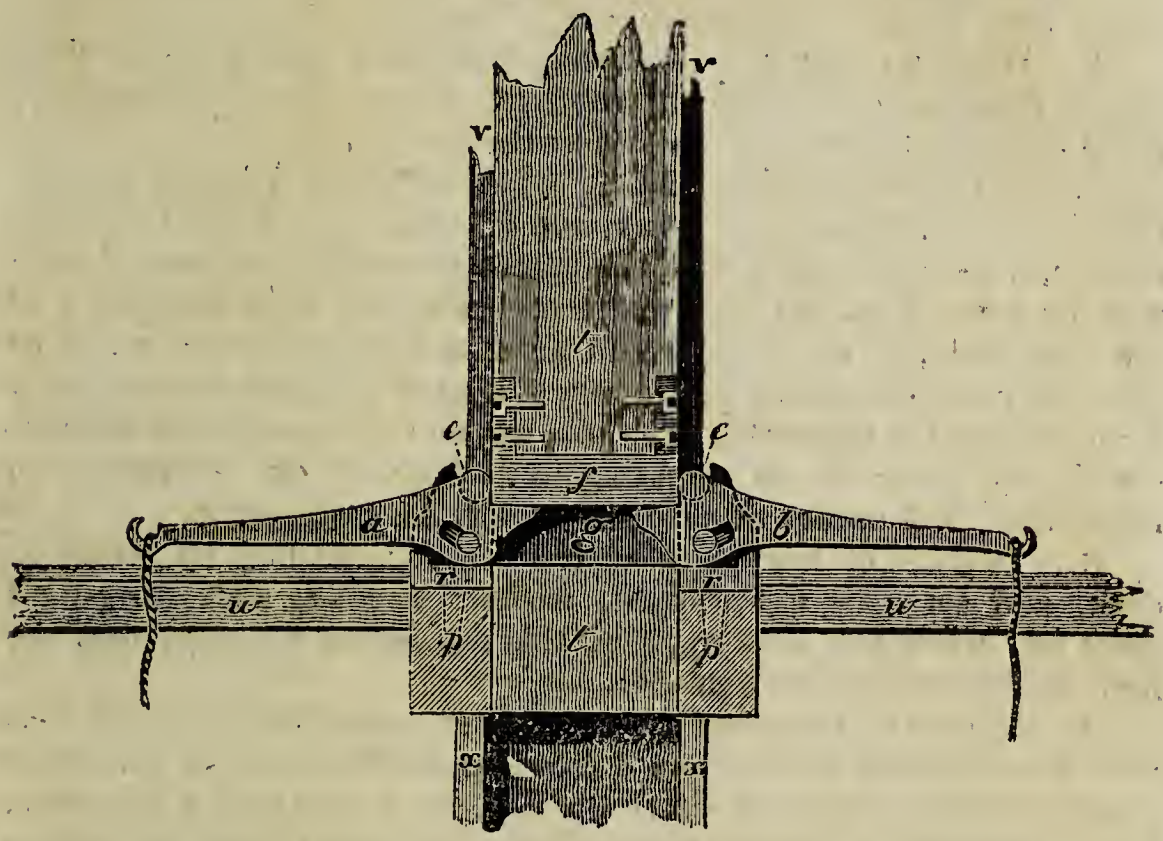


The brick-work is first carried up from the bottom of a cylindrical figure to the height of 24 inches, leaving proper apertures for the delivery of the ashes, the reception of three water troughs (two of which are shewn at *e e*), and for the insertion of the bellows-pipe; the circular aperture in the centre is then covered with a fine cast iron ash-grating, which forms the bottom of the furnace. The courses of brick-work are next carried up a foot higher, and the whole is surmounted by a flat cast iron plate *a a*, which is cast in two pieces (as shewn by the dividing line), with a rim or border *b*, of five or six inches high, round the external periphery, forming therewith a most convenient dish for holding the fuel to replenish the central fire. The circumference of the interior opening of the cast iron plates *a a*, is just large enough to admit of an iron frame, which consists of two strong flat rings, three inches broad, connected together by three pillars of support, and cast all in one piece; the lower ring *c* rests upon the fire-brick of the furnace, and upon the upper is built the cylindrical chimney *d*, which is immediately over the fire (about nine inches above it), and is carried up to the required height. *f* are the bellows, suspended to a frame by means of a pivot on each side. The bellows are worked by means of a lever *g*, which encircling the chimney, affords every workman employed the convenience of acting upon it with facility: and as this construction of the forge will admit of six work-people being employed around it in making of nails, the fire is always kept up bright and vivid, by the continual blasts from the bellows.

With respect to the advantages of the Patent Forge, the inventor observes—"By the peculiar construction of the fire place, wood-charcoal alone may be used, which cannot be done in other forges; but by a mixture of wood-charcoal with coke for fuel, the metals to be wrought will acquire a surprising degree of malleability and

weld with great ease, their tenacity and clearness will also be improved, and they will have, when cold, a better face or skin than can be put upon them by any other method. In addition to the great advantage of apportioning the fuel to the work required, the circular form will admit of a larger number of workmen being employed at the same time at this forge than at auy other, thereby causing a saving of brick-work in the erection of forges—of bellows and shop-room for working them—and a permanent saving in the fuel for their consumption."

We understand that Messrs. Lloyd and Smith, of Bennet's-hill Upper Thames-street, have a furnace of this kind fitted up on account of the Patentee, for inspection.



ROTCH'S PATENT LEVER FIDS,

By which Ships may strike their Topmasts or Topgallant Masts, at any moment in less than one minute, and fid them again in less than five minutes, without slacking a lanyard, or starting any other part of the rigging attached to them.

This invention from the strong approbation and patronage which it has received from those who are best qualified to appreciate its merits, is considered to be of invaluable service in nautical operations.

The peculiar properties of these Fids are, that when it is required to lower the topmast, the strength of one man is always sufficient to take out the fids, and when it is required to get the mast on end again, the very act of fidding the masts sets all the rigging taught again, and only requires the strength of two men, unless the ship be of a much larger class than ordinary merchantmen.

Reference to Engraving.—*a b* are the two levers and their car-

riages exhibited in section, *e e* the trunnions, gudgeons, or axes, on which they turn; *r r* the carriages or bearings for the axes, the upper parts of which are shown extending above the axes; *f* the fid plate, in the fid-hole *g*. (It should be observed that the fid plate on this plan should be much stronger than on the old plan). *t t* the topmast, *v v* the lower mast head, behind the topmast; *p p* the trestle trees; *x x* the cheeks of the mast which support the trestle-trees; *w w* the cross trees with the top above.

The Patent Lever Fids may be applied to any ship, without any alteration in her tops, mast, or fid holes; and may be fitted by any ship's carpenter in the course of an hour. It would be an endless task to name all the various situations in which the patent lever fid promises to be of important service to navigators from the rapidity and certainty of its operations. The most prominent cases and those of the most frequent occurrence, are,

1. When a sharp ship catches aground on a rapidly falling tide, often falling over before the topmasts can be got down, particularly, if the topgallant masts are on end at the time.

2. In sudden squalls of wind, when ships are riding at anchor, they may lower their upper masts, and fid them again when the squall is over, with such facility with the patent lever fid, that many a cable will be saved from parting, and many an anchor from dragging; at the same time, if the ship should only be waiting for the storm to blow over that she might put to sea, this need not deter the navigator from striking his topmasts, since, the moment they were fidded again, the rigging being set up taught again by the very act of fidding, he might carry sail on her at once, as soon as he could set it.

3. In gales of wind at sea, the upper masts may be struck at dark, and set again at day-light, without trouble, with the patent lever fid, while the advantage of this manœuvre to ships that are light handed will be incalculable.

4. In case of springing a topmast just above the cap, which it is well known is the place where it most frequently goes, or in case of a topmast being wounded above the cap, by a shot from a privateer, pirate, or enemy's cruiser, giving chase, the patent lever fids will be found invaluable, as the topmast may be instantly lowered till the wounded part is below the cap, by just shaking the vessel in the wind for half a minute, when all will be safe, and she may be kept on her course again. It is almost needless to observe, how much more fearlessly a navigator would carry sail, in case of being chased by a privateer or other enemy, if he had this resource in case of accident.

5. As regards the utility of the patent lever fids to topgallant masts, nothing need be said, the every-day experience of all navigators leading them to the practice of constantly striking and fidding their topgallant masts, which would be even more frequently done in ships having the patent lever fids, because the facility of doing so would be so much the greater.

The Patent Lever Fids have been fitted to the Sybelle Frigate and Tamar, the Sparrowhawk and the Maidstone.

Permission was likewise recently given the Patentee to experiment upon the Prince Regent *(of* 120 *guns.)* Captain Parry who, together with several other competent officers, were appointed to examine into its effects. We subjoin an account of the proceedings which then took place, and the high testimonials of approbation which immediately followed seem the best praise which can be given to the inventor.

"The Commissioners appointed by the Right Honourable the Lords of the Admiralty to meet Mr. Rotch, the barrister, on board H. M. S. Prince Regent, to witness the effect of his very ingenious invention, the Lever Fid, met at Chatham, on Saturday, the 19th ult. for that purpose. Mr. Rotch arrived the day before, and having been introduced by Capt. Parry, who commands the Prince Regent, proceeded with Mr. Cole, (the first Lieutenant) to inspect the manner in which the Fids had been fitted, and which had been done under the superintendance of Mr. Kingston, the master millwright of His Majesty's dock-yard, at Portsmouth, who had obtained leave from the Commissioners of the Navy for that purpose.—Mr. Rotch having satisfied himself of the very perfect manner in which the work had been performed made a variety of experiments and went through several manœuvres with the Fids, by way of a preparatory rehearsal, and on the following day (Saturday) at twelve o'clock, the officers named in the commission, together with several of the officers of the dock-yard, who were also ordered by the Lords of the Admiralty to attend, and some naval officers of distinction, who were attracted by curiosity, repaired on board the Prince Regent. The top-gallant masts were on end, the rigging taught set up, and not a single man aloft when Capt. Parry gave the order to strike topmasts and top-gallant masts, and, in exactly two minutes and a half from the time the word was given, the whole six masts were struck. It should be observed, that this included the time required for men to get from the deck to the topmast heads, all hands being on deck when the word was given.

"It really appeared like magic: at one moment every mast was in its place, and every rope strained tight, and, the next, the masts were down, and the rigging in complete confusion; and, what rendered the effect the more imposing was the fact, that only four men in each top and one at each top-mast head, went aloft to perform this sudden manœuvre. The instantaneous striking of the topmasts is all that Mr. Rotch professes to perform by his very ingenious invention; but such is the immense power of his fid, that, at the request of Capt. Parry, the main-topmast was fidded again in three minutes, without starting a landyard, the lever fids straining the rigging as taught as it was before, and bringing every thing to its proper place again, as if the mast had never been struck.

"Capt. Mingay was labouring under severe indisposition, but Capt. Parry and Capt. Clavering, who were of the committee, with a zeal and alacrity that did them infinite credit, with several other officers and gentlemen, then went aloft into the main-top, and while there the manœuvre of striking and fidding the topmast was repeated

with a rapidity and facility that truly astonished every one who witnessed it. The committee and every competent judge on board the Prince Regent expressed their unqualified approbation of the Invention.

" With Mr. Rotch's Lever Fid, ten men are sufficient, in the worst weather, to unfid the main-topmast of the largest first-rate line-of-battle ship in the English Navy, a manœuvre which, with Fids on the ordinary plan, requires the united exertion of the whole ship's company, and instances have been known, where even their joint efforts have proved unavailing.

" The naval officers named in the commission were Capt. Parry, of the Prince Regent, Capt. Mingay, of the Hyperian, and Capt. Clavering, of the Redwing, and the officers of the dock-yard, who attended by order of the Lords of the Admiralty, were, Mr. Payne, master attendant, Mr. Millions, assistant master attendant, Mr. Weekes and Mr. Hawke, master shipwright's assistants, and Mr. Lair.

MR. BROUGHAM'S PAMPHLET,

" UPON THE EDUCATION OF THE PEOPLE."

Mr. Brougham has written a Book addressed to the working classes and their employers," upon one of the most important topics of political economy. This object is to excite in the minds of the labouring classes an ardent desire for mental improvement, and to encourage the feeling which they have recently displayed to call into action the best faculties of the mind.

He sets out by considering in what way the attainment of this object can be most successfully promoted, and arrives at the conclusion that no plan can be more efficient than the diffusion of scientific and literary publications in a cheap and accessible form. He then enumerates some of the weekly works which are just now extant,* and the advantages which must necessarily result from the perusal of them by those who have heretofore been, as it were, shut out from every means of acquiring those " riches which never fade." He particularizes the institution and societies which have been formed in various parts of the kingdom for the instruction of the people ; and the uniform success which has resulted from their establishment. The remarks which are interspersed throughout the pamphlet are eminently calculated to arouse the sleeping spirit of the poor to a sense of the benefits which cannot fail to accrue from the pursuit of knowledge, and when our object is to recommend this little Book to every one of our readers (for it costs but sixpence) in terms of the strongest and most unequivocal approbation, we purposely avoid giving any extract in support of the view we have taken of it. It has already reached many editions without the quacking aid of puff advertisements, which is the best test of its intrinsic worth, and although the pecuniary profits are to be appropriated to the Mecha-

* When we say *to the exclusion of the Register, to our* present notice must, we think, bear something of the stamp of *impartiality*.

nic's Institution, we hope and believe that profits of a higher description will be generally derived by those to whom the "Observations" are especially directed, and we doubt not that the efforts which this enlightened statesman has continually made to benefit the poorer classes of the community will be by them felt and properly appreciated—we are sure he seeks no other reward.

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. IX.—*(Continued from page 205.)*

AMMONIAC (Gum). This is a gum resin, which oozes from a plant of the umbelliferous kind. According to Bracconet it consists of 70. resin, 18.4 gum, 4.4 glutinous matter, 6 water, and 1.2 less in 100 parts. It forms a milky solution with water, and is partially soluble in alcohol. The former will dissolve seven drams out of an ounce and the latter six drams. It is entirely soluble in ether, nitric acid, and the alkalis. It has a peculiar and not agreeable smell, and a bitter-sweet taste. Pliny states that this gum took its name from the temple of Jupiter Ammon, in western Egypt, in which part it grew. It is brought to us from Turkey and the East Indies, in small agglutinated pieces of a yellowish-white colour. It may be purified from seeds and small stones, which are frequently found intermixed, by dissolving it in a little boiling water, pressing it while hot through a strainer, and then inspissating it to its former consistence. It is chiefly used in medicine as an expectorant and antispasmodic; for such uses the larger and finer tears, unpurified, are preferable to the common strained gum; the more milky grains are considered the best, and require no purification.

ANACARDIUM.—*Cashew-nut*, or *Marking-nut*. The tree which yields these nuts grows naturally in the West Indies, and arrives at the height of 20 feet. The fruit is as large as an orange, and is full of an agreeable sub-acid juice, which is frequently used in making of punch. A pleasant wine is also obtained from it by subjecting the expressed juice to fermentation; and the wine when distilled, yields a fine aromatic spirit, excelling those of rum and arrack. From the apex of this fruit proceeds the nut, which is kidney shaped, enclosed in two shells, the outer of an ash colour and smooth, and the inner covers the kernel. Between these shells is lodged a thick, inflammable, and very caustic oily liquid, which incautiously applied to the lips and mouth will inflame and excoriate them. On account of its possessing this remarkable property, it is employed by the ladies in the West Indies as a cosmetic for removing freckles, by destroying the skin, the new skin which succeeds being as fair as that of a new born infant. This oil is likewise successfully used for eating off ring-worms, cancerous ulcers, warts, and corns; but persons who are not aware of its effects should be cautious in the use of it. As a marking ink, for writing on linen

and cotton, it is very excellent, as no washing will extract the stain, which continues at the same time to grow blacker. Smeared over wood, it prevents decay, and might, therefore, be found an excellent preservative against the dry-rot, which is so destructive to our houses and shipping. The fresh kernels of the nuts have a delicious taste, and are eaten raw, roasted or pickled; ground with cacao, it much improves the chocolate. The milky juice of the tree, obtained by tapping or incision, will stain linen of a deep black, which cannot be washed out; whether it has the same property as the eastern anacardium has not been yet fully ascertained: the inspissated juice of that tree being the best sort of lac used in China and Japan for staining black.

ANACLASTIC GLASSES are a kind of sonorous phials, chiefly made in Germany, which have the property of becoming flexible, and of emitting a violent noise when breathed into. By the Germans they are called *vexier glaser*, or vexing glasses, on account of the fright and disturbance they occasion by their resilition. They are a low kind of phials with flat bellies, resembling inverted funnels, whose bottoms are exceedingly thin, and rather convex. Upon applying the mouth to the orifice, and gently inspiring, or as it were sucking out the air, the bottom gives way with an amazing report, and from being convex becomes concave. On the contrary, upon expiring or breathing gently into the orifice of the same glass the bottom with another horrible crack bounds back into its former place, becoming convex as before. It is to be observed, that if the bottom be concave at the time of inspiration, it will burst, and the same effect takes place if the bottom be convex at the time of expiration; breathing *strongly* will however cause them to burst, under contrary circumstances. They are all made of fine white glass, with their bottoms as thin as they can be blown.

ANALEMMA, in mathematics, a planisphere, or projection of the sphere on the plane of the meridian, orthographically made by perpendicular lines from every point of that plane, the eye being supposed to be at an infinite distance and in the eastern or western points of the horizon.

Analemma denotes likes an instrument of brass or wood, upon which this kind of projection is drawn, with a horizon and cursor fitted to it, wherein the solstitial colure and all its parallels are projected into concentric circles; all circles oblique to the eye are ellipses; and all circles whose planes pass through the eye, are right lines. The chief use of this instrument is for finding the time of the sun's rising and setting, the length of the longest day in any latitude, and the hour of the day. The analemma is also much used by Diallists, for laying down the signs of the zodiac, with the length of the days and other matters.

ANALYSIS, in a general sense, is the resolution of something compounded into its constituent parts. Hence, analysis, in chemistry is the separation of a substance into its constituents, thereby to ascertain their nature, relative proportion, and mode of union: thus, by the decomposition of water it is found to consist of 85 of

oxygen and 15 of hydrogen in 100 parts. As the giving of a complete account of the art of analysis would require the enumeration of almost every known fact in chemistry, and as it would likewise be departing from the plan we had marked out for our course, we must refer the reader to the works of our best chemists for information.

Analysis in mathematics is the method of resolving mathematical problems, by reducing them into equations; and may be divided into *ancient* and *modern*. The ancients, in their analysis, proceeded from the thing sought, to something really known or granted. Modern analysis comprehends algebra, arithmetic of infinites, infinite series, increments, fluxions, &c. The modern analysis is a general instrument by which the finest inventions and the greatest improvements have been made in mathematics and philosophy for the last two centuries. It furnishes us with the most perfect examples of the manner in which the art of reasoning should be employed; and gives to the mind an uncommon readiness in discovering things unknown, from a few data given; and by using signs for ideas, it presents things to the understanding which would otherwise seem beyond its sphere. By means of this, geometrical demonstrations may be abridged; and a long train of reasoning wherein the mind cannot without the utmost effort discover the connection of ideas, is clearly expressed by sensible signs, by their peculiar arrangement and combination. By this art a great number of truths may be expressed in a single line, which by the ordinary method of demonstration would occupy pages and even volumes, and thus by the contemplation of a single line, we may acquire in a short time, the knowledge of a whole science, which would otherwise take years to comprehend.—SEE *Hutton's Mathematical Dictionary*.

ANCHOR, is an instrument used for retaining a vessel in a harbour, road, or river; the form or construction of which is too well known to need description here. The most ancient anchors were of stone, and sometimes of wood, to which a quantity of lead was fixed. Afterwards, when constructed of iron, they had only one fluke at first. All anchors have now at least two arms or flukes, and they are mostly made of forged iron, though some are made in Spain and elsewhere of copper.

There are several kinds of anchors; the *sheet-anchor*, which is the largest, and is never used but in violent storms, to prevent the ship from being driven ashore: the two *bower anchors*, which are used for ships to ride in a harbour: the *stream and kedge anchors*, which are smaller, and *grapnels* which are used only for boats. Brigs and cutters carry three anchors; sloops and ships of 300 tons have five; vessels of from 20 to 80 guns inclusive take six, and ships of larger dimensions seven anchors.

The making of anchors is a very laborious business, notwithstanding it has of late years been much facilitated by the invention of two machines called the Hercules and the Monkey. Many improvements in the form and construction of anchors have recently been patented, but the invention of Mr. George Hawkes, described in the last number of this Work, is perhaps the most deserving of notice. *(To be continued).*

RECENT PATENTS.

NEW ROTATORY MACHINERY.—To Henry Barnett, of Arundel Street, for certain improvements in machinery, for a new rotatory or endless lever action. Sealed 19th Feb. 1825.

WATER CLOSETS.—To John Beacham, of Paradise Street, Finsbury, for certain improvements in water closets. Sealed 19th Feb. 1825.

FLOUR-DRESSING.—To James Ayton, of Trowse, Millgate, Norfolk, for an improvement to be applied to bolting mills, for the purpose of facilitating and improving the dressing of flour and other substances. Sealed 19th Feb. 1825.

TO READERS AND CORRESPONDENTS.

We are requested by a Correspondent, to enquire whether there is any Gentleman conversant with the science of Chemistry, who is in the habits of attending Families as a Lecturer. He says that he has reason to believe that there are many Private Families most anxious to acquire a knowledge of that delightful science, who from domestic circumstances would feel indisposed to attend the generality of public Lectures. "I think," he continues, "that this subject is deserving consideration by those persons who have been engaged in assisting Lecturers in their public discourses and experimental observations. At a time like the present when scientific knowledge is engaging the attention of almost every class of society, it would be a really desirable thing that instruction should be afforded in this way. The generality of Lecturers go too deeply into the sciences of which they treat. These subjects should be as much as possible divested of the dryness and technicalities in which they are now envelopped, and it would be no very difficult task to communicate the elementary principles to those whose sudies have been differently directed.

"The experiments may be very simple. To an intelligent man, a solitary candle would afford an abundancy of material to dilate upon. He will have before him a direct illustration of two most important subjects: light and heat. He will treat of the principle of combustion, of the cause of light, dryness to the solar rays, and their effect upon vegetable economy of gaseous matters and their relative proportions for the production of light. He will expatiate upon caloric or the matter of heat, deduce from it most important conclusions and an endless variety of consequences, each interesting and all delightful.

"I trust that the hint which I have here thrown out will meet with consideration, and shall be well pleased to learn through the medium of your pages whether any competent person and whom might be applied to for the purpose I have above named."

W. H. B's enquiries are too vague. He will however find some of the information he seeks, by referring to No. 28 vol. ii. page 55 of this work.

We think that the suggestion of *Anti-rattling* is very good; but his plan appears to be too unmatured to appear in a public shape. We would recommend him to consider the matter well, and place it in a tangible point of view before he brings it forward. If he wishes to communicate his projected "improvement," we promise to give them attention.

Eborascencis in our next number.

A Supplementary Number of this Work will be published on *Saturday* next, containing among other interesting matters, a full description of Mr. James's Patent Railway—Mr. F. Russell's *New Power* Engine—Franklin's High Pressure Engine—Barton's Fire Engine, &c. &c. with numerous Engravings.

[*To be continued every Fortnight.*]

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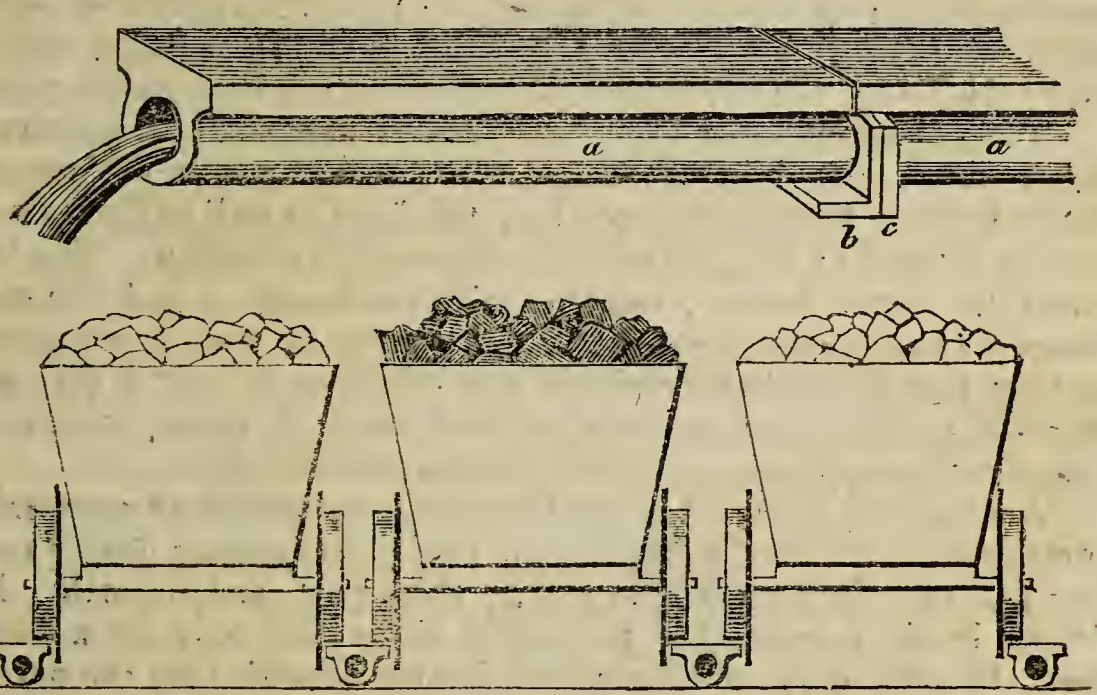
CONTENTS:

James's Patent improved Rail-way or Tram Road..... 241
Proposed New Power..... 244
Manufacture of Pearls in China 246
Barton's Fire Engine and Ship's Pump 247
Self-acting Feeder for High Pressure Steam Boilers 249
Infusion of Red Cabbage 250
Dr. Morrison's Ear Trumpet... 251
Straker's new Mode of embossing on Wood 252
New Zealand Flax..... 252
Answer to I. H. H. respecting the insalubrious Effects of ignited Charcoal 253

Miscellaneous—Blood, 254;—Effects of Hydrogen Gas, *ib*;—Cause of Earthquakes, *ib*;—Tempering Steel, *ib*;—Evaporation of the Sea, 255; New Mechanical Power, 256;—Embanking Land from the Sea, *ib*.—Patents, Correspondents, &c. *ib*.



JAMES'S PATENT IMPROVED RAIL-WAY, OR TRAM-ROAD.

This invention appears to be a great improvement upon the ordinary construction of Rail-roads, and will probably lead to very important results, by materially facilitating our inland communication. By peculiar adaptations it embraces the principle of locomotion, at only half its expence, and without many of the inconveniences usually attending that mode of conveyance; and by a happy application of its powers, it suits itself more especially for hilly and even mountainous countries, where the construction of good roads have hitherto been deemed impracticable, or unadvisable in point of economy. The Patentee* is a gentleman, who has been for a series of years exten-

* William James, Esq. of Thavies Inn, Holborn.

sively engaged in the construction of rail-road communications, in the working of mines, and in other branches of civil engineering immediately connected with such undertakings; which we mention to shew that it is not a mere theoretical speculation, but an invention founded upon practical experience during a long course of observation, and as such it is well entitled to the attentive consideration of the public.

The principal and leading feature consists in making the rail hollow, or tubular; and from this construction results various advantages which we shall presently notice.

It has, we believe, been proved by direct experiment that a *hollow* cylinder of metal is much stronger than a *solid* cylinder of the same metal; that when both cylinders are of an equal weight and length, and of the diameter contemplated for this rail-road, the strength of the former is to the latter, as 1¼ to 1: consequently, an immense saving may thus be made at once in the material employed in the construction of the rails.* But if a like quantity of metal (or other material) be used as in the common rails, then tube rails may be produced therefrom of greater strength, with a broader base, and more solidity of bearing; and thereby be rendered capable of better withstanding the effects of heavily laden carriages passing rapidly over them: thus the advantages in both cases are in a similar ratio.

The *general* form of the patent rail is shewn in perspective at *fig.* 1. in the preceding engraving; that precise figure is not however the limit of the Patentee's invention, the form as well as the material may be altered or adapted to circumstances and situation. The tube *a* and the upper surface, together with the flanges *c* and the chair flange *b* (which rests upon the sleepers) may be cast in one piece; or they may be made of wrought iron wholly or in part; they may be tubes of metal inserted into cases of wood or stone, with other variations as economy may dictate in the peculiar case.

Another improvement of the Patentee's consists in an economical arrangement of the rails forming the road. In common double roads two pair of rails are used, in treble, three pair, and so forth. Mr. James in his specification prescribes three rails only for a double road, by making the middle rail of greater breadth than the outside rails, so as to admit of two carriages to pass one another thereupon; in like manner a treble road is to be made of four rails only, which we have especially represented by the second figure in our frontispiece.

As the ordinary tram-waggons are too narrow for the carriage of bulky light goods, such as cotton, wool, hay, &c. it is further suggested that waggons for such purposes be constructed of double width, so as to embrace two lines of rail-way; thus a double road-way may be used either as a single road-way for the broad waggons, or as a double one for the narrow waggons; in the same manner the treble roads may be used either as double or treble road-ways. As the tubular construction of the rails affords the means of conducting water, gas, and other fluids through them, the Patentee avails

---

* At the present value of iron the saving would be about £6. per ton.

himself of this important advantage, and proposes thereby to supply the London Sea Bathing Companies with salt water from the ocean; the inhabitants on the line of the rail road, or adjacent towns and villages, with pure fresh water for domestic use, and inflammable gas for lighting their shops and houses as well as the turnpike-roads.

Those rail-roads upon which locomotive engines travel, are necessarily made very massive to enable them to support their ponderous loads, and the quantity of metal consumed therein is consequently much greater than in the ordinary tram-roads; now Mr. James's Railway is, in the first instance, much lighter than the ordinary tram-road, and secondly, it embraces the principle of locomotion by affording powerful means of propulsion by natural as well as artificial aid.

The natural aid we allude to is that of water. It has been often observed, and we believe it is invariably the fact, that rivers have their origin in mountains, hills, or elevated lakes. From this source, therefore, will Mr. James derive his power, so great, that he will, frequently, (besides propelling his waggons) have it *to spare* for the driving of mills and other machinery, which will, probably, be erected on either side of his *iron-course,* and people the barren hills and mountains with industrious mechanics *

By artificial aid we implied the employment of rods, wheels, gear, and endless chains, to be attached to the rails, and worked by stationary steam engines at suitable distances along the line. The various contrivances to effect this are highly ingenious; we shall now describe two or three of them.

Along a double rail-road, for instance, the middle rail is to have passed up through its tube a series of rods connected end to end by any of the ordinary means, such as coupling-boxes, clutches, &c. so that the whole length of rods shall revolve as one axle.† In suitable parts of this line of rods pinions are fixed on it, which take into the cogs of horizontal wheels under the rods. Beneath the horizontal wheels and upon their shafts are fixed drum wheels, from drum-wheel to drum-wheel an endless chain passes, embracing their peripheries, so that if the actuating power of the engine be applied directly to the length of the rods, their pinions turn the horizontal wheels, and with them the drum-wheels, by which means the endless chains which connect them are dragged along the sides of the railway over anti-friction rollers; and the carriages attaching themselves to the chains by a very simple contrivance of the latch kind are carried along all together. When the power of the first mover is applied to a horizontal wheel, instead of the rod, the effect in giving motion to the whole must evidently be the same.

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* As it is a mis-application of the gifts of nature to build manufactories on ground suited for tillage, such an arrangement as the above, if it could be carried extensively into effect, would be a great public advantage.

† Revolving rods of great length are employed in driving machinery in various parts of England. Near Stratford upon Avon one nearly half a mile long actuates machinery at the farthest end from the first mover, with the power of six horses.

By another method of propelling the carriages along the rail-way the Patentee proposes to fix to each carriage an apparatus like a common ladder, which is to be attached exteriorly from the fore to the hind axle of each carriage, lying flat-ways and horizontally. The rail will contain (as in the method last described) a length or series of rods provided with pinion wheels at regular distances; these pinions, however, are to work horizontal lateral shafts crossing the rail-way and underneath it. The ends of these lateral shafts are to be armed with claws or arms, which, as they revolve by the action of the central rod, take hold of the *steps* (which are made to revolve) of the ladders, and thus continually drive forward the carriages upon the rail-way.

We cannot quit this interesting subject without again adverting to the application of this invention to a fall of water, more particularly when it can be obtained at any considerable elevation. The power is first applied by being thrown upon an overshot wheel, it is received below into a reservoir, and re-conducted into the tube rail, where lower down the line its powers are again brought into action; the water is collected again, and again made use of till it arrives to the lowest level; and as the stream is continuous, the sum of all the separate powers may be united, if required, to produce one prodigious effect.

PROPOSED NEW POWER.

We copy from the Times Newspaper the following statement respecting a "proposed New Power."

"*To the Editor of the Times.*

"Sir,

"Having been yesterday informed, that a chemist of high note in this country is now engaged in experiments upon the principle of a new power, which principle has also occurred to myself, I trust to your liberality and justice for the early insertion of the following statement :—

"TO ENGINEERS AND OTHERS.

"It is in my power to prove that the same idea suggested itself to me three or four months since, was then communicated to several individuals, and that I have very recently repeated a trial of its feasibility with a view to future publication. The above information may or may not be correct. However, whether this be another instance of singular coincidence of thought, or otherwise, I naturally feel anxious to secure the claim of originality; at all events no time can be more favourable for the publication than the present.

"It is proposed, then, to employ condensed inflammable gas as a propelling power. The principle seems every way practicable, and if so, its utility would, it must be admitted, be prodigious, combining economy in the space to be occupied and the materials and mechanism with simplicity and safety.

"The mechanism might be simply this—a small cylinder for the

reception and explosion of the gas, above the cylinder the piston, dropping upon a shoulder. The ascent of the rod of the piston would work the arm of a forcing pump, whose cylinder would be thus filled with gas through a valve from without; the natural descent of the piston would, first, by its action on the arm of the pump, force the gas from the pump into the exploding receiver or barrel: the piston's farther descent would, by means of a rod, open a valve in the side of the barrel, so that a gas-light might ignite the gas within, and the expansion raise the piston; or the light might burn in a small chamber under the cylinder, and the piston, secondly, close the chamber by means of a connected rod, and immediately after, by acting on an air-tight peg, open a valve above the light, and kindle the gas within. The process would thus be self-acting, and repeated, one valve re-open, the other close, and the pump supply and discharge itself by the re-ascent and descent of the piston. The power would of course depend on the size of the pump-cylinder, and of the exploding barrel. I beg to be your obliged and obedient servant,

"*Holborn-court, Gray's Inn,* "F. RUSSELL.

"*March* 8.

"P. S. The piston would of course be checked in its ascent, and at the highest point of the tube would be an aperture to carry off the exploded gas, and re-admit a certain quantity of common air from a cavity, where the noise of the report would be lost."

The annexed diagram and description we have received in illustration of the above proposition,

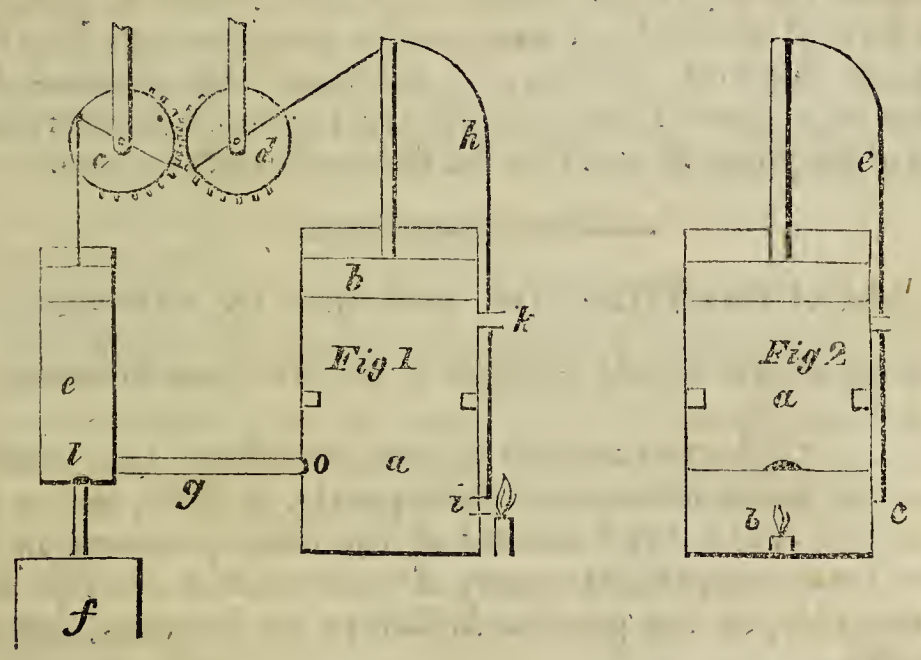


Fig. 1, exhibits a sketch of the apparatus at the moment after explosion, in which the several parts are not to be considered as complete, nor as being in their exact proportions. *a* is the gas exploding cylinder, *b* the piston, *c* the pump lever, *d* a similarly formed lever connected with the piston rod of the exploding cylinder, and acting on the lever *c*. *e* is the pump cylinder now filled in the position exhibited in the machinery; *f* the reservoir containing gas, from

which the pump draws its supply. The exploded gas having escaped through the aperture *k*, and the piston naturally returning, forces down simultaneously the plunger of the pump, and drives the gas contained therein along the tube *g* into *a* the exploder, and the valve *i* is opened at the time of the lowest descent of the piston, when an explosion ensues, a light being placed near to the valve for that purpose. *l* and *o* are two valves, the uses of which are obvious.

Fig. 2 represents the other mode of ignition. *a* the exploding cylinder, *b* the light under the valve *d*, which is opened by similar means to the valve *i* in *Fig.* 1, the door of the chamber *c* having been first closed by rod *e*.

It is quite clear that Mr. F. Russell could not have been aware, when he wrote the preceding letter in the Times, that there had already been several unsuccessful attempts to render available the mechanical force of an explosive mixture of hydrogen gas with common air (in one of which the electric spark was employed to produce ignition*) ; but we are not informed whether any of those ingenious experimentalists employed the explosive mixture in a compressed or condensed state. The undertaking is apparently fraught with great difficulties, which, if not absolutely insurmountable, we are persuaded Mr. F. Russell has a genius capable of overcoming them.

Lest any of our readers should suppose that there exists any analogy between the "proposed New Power" and Mr. Brown's Gas Vacuum Engine, we beg leave to observe, that a perusal of our 22d and 25th Numbers (which give a detailed account of that admirable and successful invention), will convince them that the line of distinction is very wide indeed. In Mr. Brown's, the motive power is derived simply from atmospheric pressure, but Mr. Russell proposes, in the first instance, to overcome that pressure by the application of a greater power *under* the piston, and afterwards to allow the atmosphere to exert its full force above the piston.

MANUFACTURE OF PEARLS IN CHINA.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"HAVING noticed in your miscellany two interesting papers on the manufacture of artificial pearls, at Paris, and at Rome, I have thought that a brief account of the mode practised in China might not be unacceptable to many of your readers ; which art was attempted to be put into practice in Europe by Linnæus, but proved unsuccessful.

"That ingenious people, the Chinese, in a manner, force the production of the article in the animal itself. They collect the mya margaritefera, or European pearl muscle, and pierce the outsides of the shells in several parts, without completing the perforation

* We mention this as a hint to Mr. F. Russell, should he prosecute his scheme by farther study of the matter.

throughout. The animal becoming conscious of the weakness or deficiency of the shell in those particular spots, deposits over them a great quantity of its pearly calcareous matter, and thus forms so many pearly tubercles over them. The pearls thus obtained are however said to be generally inferior to those naturally produced.

"EKUL."

BARTON'S FIRE ENGINE AND SHIPS' PUMP.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"NOTICING in the Public Journals of the last week the melancholy intelligence of the burning of the Kent East Indiaman, and the destruction of many of the crew; and likewise the many fires in various parts of town; which must not only excite the sympathy and feelings of all ranks of society, but ought also to induce every scientific man to think of some means, whereby such unfortunate occurrences may in future be prevented. With this view, I beg, through the means of your valuable Journal, to inform the public, that I have invented an apparatus, which is by far the most powerful *Ships' Pump* and *Fire Engine* at present known, to both of which purposes it is alike applicable. As a Ship's Pump, it is found to perform double duty of any pump used for that purpose, and there being so little friction, it is worked with half the labour, and is not liable to get out of repair. As a Fire Engine it is equally valuable, and can be applied to both objects (raising of water and extinguishing of fire) at the same time, without the least difficulty or delay. It has been inspected and approved of by several of the most eminent and scientific men, who have given it their decided approbation; and I have no hesitation in asserting, that if the apparatus in question be properly constructed, and of sufficient dimensions, it would be utterly impossible for an accident, similar to the dreadful one above-mentioned, to take place.

"I beg further to state, that, as I conceive it would be highly proper that the public should be acquainted with the particular construction and merits of this invention, I herewith send you some drawings and a description thereof, which I presume cannot be admitted into your Journal, and shall therefore prepare the necessary documents, to give it publicity in some of the ensuing monthly scientific magazines.

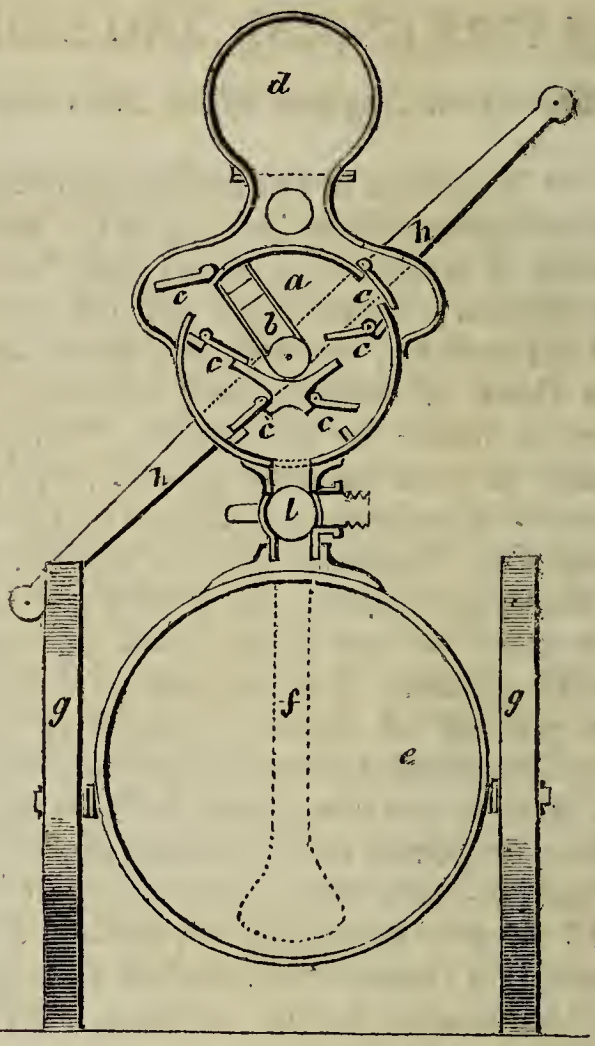
"I am, Sir,

"44, *Seward-street*, "Your very humble Servant,

"*Goswell-street*. "JOHN BARTON."

Contrary to our Correspondent's assumption, we are happy to have it in our power to make room in the present Number for an account of so valuable a machine. We have accordingly extracted from Mr. Barton's pamphlet (which accompanied the above communication) the following description, which will give a general idea of the nature and advantages of the apparatus; and we refer our

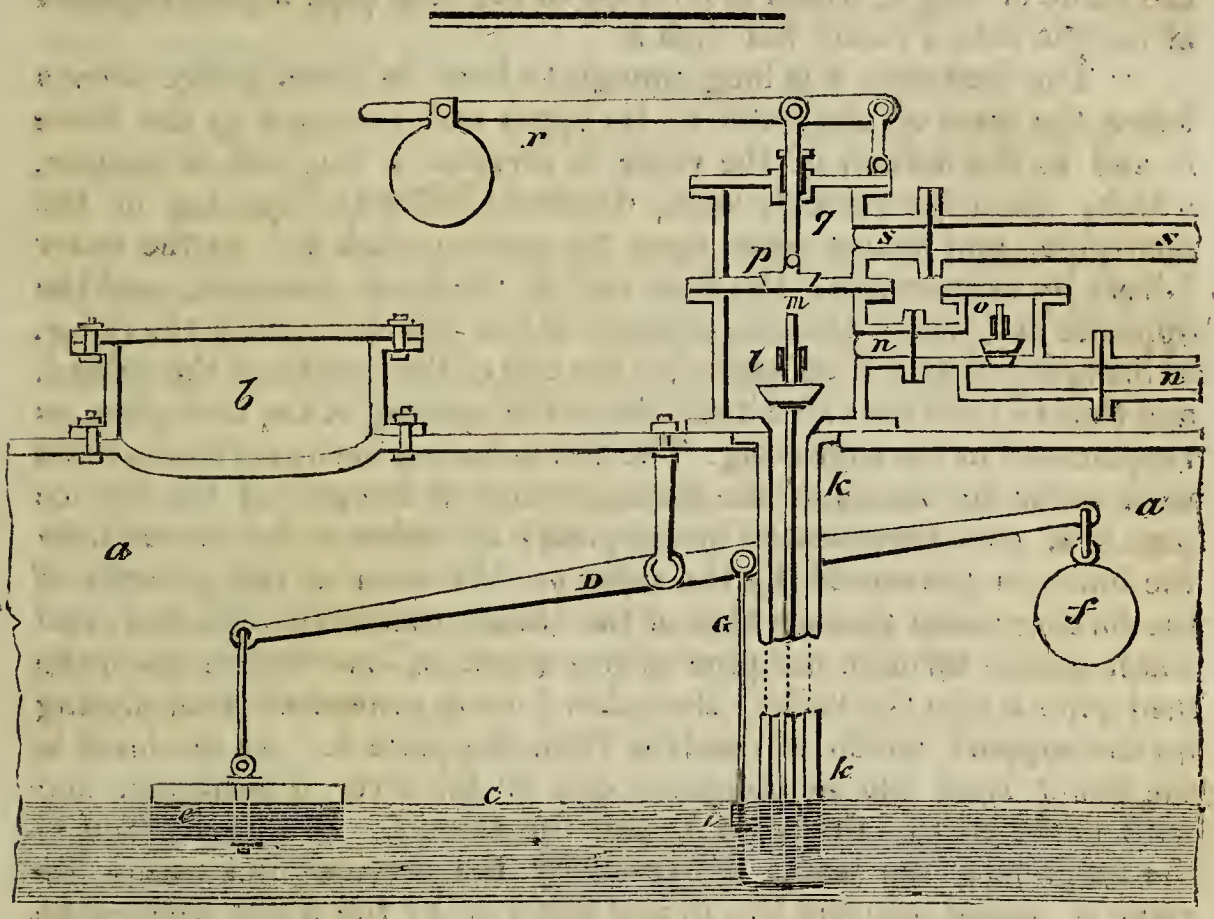
readers for a more particular examination of its merits to the work itself, which is illustrated with several engravings, and is entitled, "*A Plan and Description of a Patent Hydraulic Apparatus, invented by John Barton, Machinist and Engineer, 38, Seward-street, Goswell-street, London, as applied for an Extinguishing and Garden Engine, with some observations pointing out its general applicability to other Hydraulic and Hydrostatic purposes.*"



The above figure is an end view of the apparatus applied as an extinguishing engine, mounted on a cask or other vessel, and attached to a carriage on wheels.—*a* is the cylinder or working piece, which may be made of iron or any suitable material; *b* the fan or piston with segments and springs; *c c c c c c* six valves; *d* the air vessel; *e* the cask or reservoir, which is intended to stand full of water, so as to be in readiness for immediate action on the breaking out of a fire; *f* the suction pipe; *g* the wheels; *h* the handles or levers for working the engine; *l* the double-way cock communicating with the two pipes, by which the water is drawn either way as preferred.

"The engine is set in action by the depression and elevation of the handles *h h*, connected to the axis of the fan or piston *b*, which works backwards and forwards in the upper quarter of the cylinder, and delivers at each stroke of the engine about one half the contents of the cylinder, and may be varied to give more or less as required. The working of the fan or piston *b* being perfectly air-tight, produces a vacuum below on that side of the cylinder *a* where the handle

k is elevated, and raises the fluid to supply its place, at the same time that the fluid above is forced through the valve up the pipe on the other side of the cylinder, where the handle is depressed, and so on *vice versa*, by which a constant stream is given out.—It is likewise of the greatest importance as an engine of defence, to which purpose it can be applied with very little extra expense, and *I will engage to fire balls as fast, and with as great effect, as can be done with steam, and will put it in operation for half the expense, with this great advantage, that I can make it ready for action instantaneously.*"



SELF-ACTING FEEDER FOR HIGH-PRESSURE STEAM-BOILERS.

The inventor of this apparatus is Mr. R. W. Franklin, of No. 62, Tottenham Court Road, and much credit is due to him for the excellence of the contrivance. The following communication on the subject was received by the Society of Arts, who, in consequence, awarded to him in their last session the large Silver Medal, and Fifteen Guineas.

"It is the universal practice to feed the boilers of condensing engines by means of a float; but to its application in the usual way to high-pressure boilers there are two objections. The first is the inconvenient height of the jack-head, in order to counterbalance the pressure of the steam, (a pressure of forty pounds to the inch requiring the jack-head to be seventy feet higher than the boiler): the second is, the difficulty of packing the float-rod, so as to prevent the escape of steam, and yet allow the rod to move easily when acted on by so small a force as the hydrostatic weight of the float.

"My improvement consists in the substitution of a heavily-loaded valve, instead of a high jack-head, and in avoiding altogether the use of a stuffing box, by placing the lever of the float within the boiler, as will be evident on referring to the above engraving.

"*a a* is the top of the boiler, *b* the man hole, *c* the level of the water within the boiler, *d* a lever suspended by an arm to the top of the boiler, and having the float *e*, at one end, and the counterpoise *f* at the other. *g* is a rod of half-inch round iron, connected with that arm of the lever which carries the counterpoise: it passes through the guide or ring *i*, which is rivetted to the feed pipe *k*, and expands at bottom into a round flat dish *h*.

"The feed-pipe *k* is long enough to have its lower orifice always below the level of the water *c*; its upper end is closed by the valve *l*, and to the bottom of the valve is screwed a long tail or spindle, which, when the valve is shut, descends below the opening of the feed-pipe, and almost rests upon the plate or dish *h*. As the water lowers by evaporation, the float end of the lever descends, and the opposite end rises; the consequence of this will be to raise the rod *g*, to bring the plate *h* in contact with the end of the spindle of the valve *l*, and thus to raise the valve itself above the opening of the feed-pipe, as represented in the engraving. The box *m* having been previously filled with water by means of the forcing pump at the end of the service pipe *n n*, (not represented in the plate) all reflux of hot water from the boiler is prevented by the valve *o*. As soon as the pressure of the forcing pump exceeds that of the steam, the valve *o* is lifted, and water passes through the pipe *n* into a box *m*, and thence down the feed-pipe *k* into the boiler, the valve *l* being prevented from closing by the support which it receives from the plate *h*. As the level in the boiler rises the counterpoise end of the lever *d* descends, and with it the rod *g*, the plate *h*, and the valve *l*. In this position of the machinery the water delivered by the service-pipe raises the valve *p*, passes into the box *q*, and flows off by the waste water-pipe *s*. The valve *p* also acts as a safety valve to the boiler, its pressure being adjusted by means of the weight on the lever *r*.

"The working pressure of the steam in the boiler having been determined, the load on the valve *p* must be greater than this, but less than the power applied to the forcing-pump.

"I am, Sir, &c.

"*To A. Aiken, Esq.* "R. W. FRANKLIN."

"*Secretary, Society of Arts.*

INFUSION OF RED-CABBAGE.

A CHEMICAL TEST OF FORTY YEARS STANDING.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I HAVE taken your Register from its commencement; it has my best wishes for its success, as a publication which promises efficiently to assist in the diffusion of Science, and I am

anxious that it should be preserved as much as possible from error. Give me leave, therefore, to call your attention to Mr. Griffith's 'valuable Test for Acids, &c. which he believes will be found to 'possess a claim to originality.' This Test I have been in the constant habit of using from its first discovery, an account of which you will find in a Communication from Mr. James Watt, *forty years ago*, to the Royal Society, and published in their 74th volume, for the year 1784. It has ever since been familiar to chemists, and is introduced into many scientific works: it is, therefore, astonishing that the Society of Arts should be (as appears from their Transactions) totally unacquainted with it.

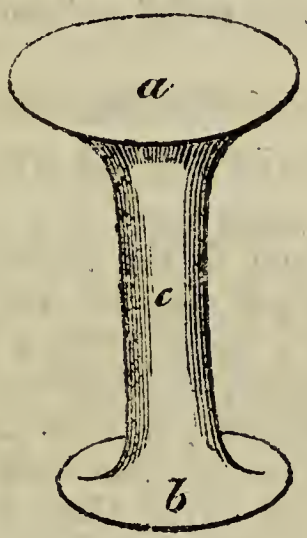
"Yours, &c.

"EBORASCENCIS."

DR. MORRISON'S EAR TRUMPET.

"P. S. If you could conveniently give such a sketch of Dr. Morrison's Ear Trumpet as would enable a country tinman to make one properly, you would much oblige many aged persons, (myself among the number) who would feel grateful for the favour."

We have the pleasure of subjoining an engraved sketch of the Ear Trumpet in question; with respect to its merits we have ourselves no knowledge whatever; and can only hope that our correspondent, and all others whom it may concern, may derive the benefit which the inventor, Dr. Thomas Morrison,* states, he unexpectedly enjoys from its use.



The shape, as appears by the above cut, is very similar to that of a common chimney jar. It is made of the best tinned plate, (commonly called "block-tin") in the following manner. A cylindrical tube, *c*, 3 inches long and 1 inch in diameter, has a trumpet-shaped piece soldered on to each end; the larger end, *a*, for collecting the sound is 3½ inches in diameter, and the smaller, *b*, for encompassing the whole ear, is about 2½ inches in diameter: the whole length when complete is 5¼ inches.

* Of Disblair Cottage, Aberdeen.

MR. STRAKER'S NEW MODE OF EMBOSSING ON WOOD.

(From the Transactions of the Society of Arts.)

Raised figures on wood, such as are employed in picture frames and other articles of ornamental cabinet work, are produced by means of carving, or by casting the pattern in Paris plaster, or other composition, and cementing or otherwise fixing it on the surface of the wood. The former mode is expensive, and the latter is inapplicable on many occasions.

The new method may be used either by itself or in aid of carving; and depends on the fact, that if a depression be made by a blunt instrument on the surface of wood, such depressed part will again rise to its original level by subsequent immersion in water.

The wood to be ornamented having first been worked out to its proper shape, is in a state to receive the drawing of the pattern; this being put in, a blunt steel tool or burnisher, or die, is to be applied successively to all those parts of the pattern intended to be in relief, and at the same time is to be driven very cautiously, without breaking the grain of the wood, till the depth of the depression is equal to the subsequent prominence of the figures. The ground is then to be reduced by planing or filing to the level of the depressed part; after which the piece of wood being placed in water, either hot or cold, the parts previously depressed will rise to their former height, and will thus form an embossed pattern, which may be finished by the usual operations of carving.

For this invention Mr. J. Straker, of Red Cross Square, Cripplegate, received an honorary medal and ten guineas from the Society of Arts.

NEW ZEALAND FLAX.

This plant, (the phormium tenax of naturalists) is employed by the natives of New Zealand in the manufacture of their apparel, cordage, and for all those purposes to which hemp and flax are employed in other countries; which latter it also greatly excels. Of this plant there are two sorts; one bearing a red flower, the other a yellow; the leaves of both are similar to those of the common flax plant, but the flowers are smaller, and their clusters more numerous. The Zealanders obtain the flax from them by very simple and expeditious means. The fibres are beautifully fine, and white, shining like silk; the cordage made from it was found by our navigators to be very much stronger, than any thing we could produce with hemp. With the view of introducing the growth of so valuable a plant in this country, Captain Ferneaux brought over some of the seeds; which were sown in Kew-garden by order of his late majesty, but unfortunately failed. Subsequent to this period, the culture has been very successfully pursued by our settlers in New South Wales, and we have been very recently indebted to Mr. Wm. Salisbury, of Brompton, for the discovery of this identical plant, (the phormium tenax, of New Zealand) growing indigenously in the south of Ireland,

where it flourishes luxuriantly. This discovery will probably prove of the utmost importance to Ireland, where the poorer classes may be profitably employed both in the culture and manufacture.

Mr. Salisbury observes, "that plants of three years old will, on an average, yield thirty-six leaves, besides a very considerable increase of off-sets, which leaves being cut down, at the time of clearing the quarters in the autumn, are found to spring up again the following summer."

Respecting the produce, the same gentleman says, "six leaves have produced me one ounce of fibres, when scutched perfectly clean and dry: at which rate an acre of land planted with this crop, at three feet distant plant from plant, will yield rather more than sixteen hundred weight per acre, which is a very great produce compared with that of either flax or hemp.

"New Zealand flax may be scutched with little labour or trouble, and may be performed by persons in common. The leaves should be cut when full grown, and macerated for a few days in stagnant water, and then passed under a roller machine properly weighted; by this process the fibres become separated, and if washed in a running stream they will instantly become white. When the fibres are thus scutched clean and dry, any kind of friction will cause them to divide into any degree of fineness in the harle, so far even as to *cottonize*, whereby, it is fitted to all the purposes to which hemp and flax are adapted."

The plant is at present under cultivation at Lord Cawdor's in Pembrokeshire, and in several parts of Devonshire. It will grow in either a dry, or a moist soil; on a hill, or in a valley, but most luxuriantly where there is an abundance of moisture.

ANSWER TO I. H. H.

(RESPECTING THE INSALUBRIOUS EFFECTS OF IGNITED CHARCOAL.)

In reply to the enquiry of I. H. H. in the 38th number of the Register, why "ignited charcoal is so dangerous in a close room, and why salt remedies it," Chemicus begs to inform him that the former is occasioned by the carbon of which the charcoal is composed, combining with the oxygen of the surrounding atmosphere thereby forming carbonic acid; an aerial fluid which is identified with that, disengaged from a fermenting vat, the agency of which is connected with respiration, is probably familiar to most; and it is the presence of the same body at the bottom of deep wells, which often proves so destructive to workmen on descending into them. With respect to the latter query, why "salt remedies it?" Chemicus begs to be allowed to confess a little scepticism on that point, for he is disposed to question its efficacy for the purpose; nor can he by any reasoning *à priori* discover why salt, or muriate of soda, under such circumstances, should exert such a salutary influence,—but "facts are stubborn things."

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Blood.—Dr. Carbonel, of Barcelona, has employed serum of blood on an extensive scale in painting. Mixed with powdered quicklime or slaked lime to a proper consistence it is easily applied on wood, to which it thus gives a coating of stone colour that dries quickly without any bad smell, and resists the action of sun and rain. The wood should be first covered with a coating of plaster, the composition must be mixed as it is used, and the serum must not be stale. It may be also used as a cement for water pipes and for stones in building under water.

Effects of Hydrogen Gas.—If a long glass tube be held over the flame obtained from hydrogen gas, moisture will speedily bedew its sides, and harmonic tones will soon begin to sound. Mr. Farraday states that carbonic oxide produces by the action of its flame similar sounds, and that therefore the effect is not due to the affections of aqueous vapour as had been formerly supposed. He shews that the sound is nothing more than the report of a continued explosion, agreeably to Sir H. Davy's just theory of the constitution of flame. Vapour of ether, made to burn from a small aperture, produces the same sonorous effect as the jet of hydrogen, of coal, or of olefiant gas, on glass and other tubes. Globes, from seven to two inches in diameter with short necks, give very low tones; bottles, Florence flasks and phials, always succeeded; air jars, from four inches diameter to a very small size, may be used. Some angular tubes were constructed of long narrow slips of glass and wood, placing three or four together so as to form a triangular or square tube, tying them round with packthread. These held over the hydrogen jet gave distinct tones.

There is another curious property of Hydrogen Gas, which has been frequently mentioned, viz. that by inspiration it changes the tones of the human voice. The following account of its first discovery is taken from the "*Journal Britannique*:" "Mannoir was one day amusing himself with Paul, at Geneva, in breathing pure hydrogen air. He inspired it with ease, and did not perceive that it had any sensible effect upon him either in entering his lungs or in passing out. But after he had taken a large dose, he was desirous of speaking, and was greatly alarmed at the sound of his voice which was become soft, shrill, and even squeaking. Paul made the same experiment upon himself, and found the same effect produced."

Cause of Earthquakes.—Earthquakes are occasioned by the decomposition of *pyrites* (native compounds of metal with sulphur). When the vapours and elastic fluids can no longer be contained in the bowels of the earth, the ground is shaken; mephitic vapours are multiplied on its surface, and dreadful hollow noises are heard.

Tempering of Steel.—In the year 1789 Mr. Hartley obtained a patent for a mode of tempering cutting instruments of steel, by immersion in oil, heated to a regulated temperature, measured by a thermometer. This was certainly a great improvement both in point

of precision and dispatch, on the common method of heating the instrument over a flame, till a certain colour produced by a film of oxide, appears on its surface. These colours are—

At 430° F. a very faint yellow for lancets.
450 .. a pale straw colour for razors and surgeons instruments.
470 .. a full yellow for penknives.
490 .. a brown for scissors and chisels for cutting old iron.
510 .. a brown with purple spots for axes and plane irons.
530 .. a purple for table knives and large shears.
550 .. a bright blue for swords, watch springs, truss springs, and bell springs.
560 .. a full blue for small fine saws, daggers, &c.
600 .. dark blue, verging on black, is the softest of all the gradations, when the metal becomes fit only for hand and pit saws, which must be soft, that their teeth may bear sharpening by the file, and setting by the hammer or pliers.

Evaporation of the Sea.—In the beginning of the last century the philosophical world was agitated with an enquiry into the origin of rivers, the vast waters of which are unceasingly being discharged into the sea. One party contended for the existence of a large mass of water within the bowels of the earth, which supplied not only the rivers but the ocean itself. Another party asserted, that the waters of the ocean were conveyed back by some subterraneous passages to the land, and being filtrated in their passage, returned again to the sea in the course of the rivers; this opinion was however too absurd to be long maintained, being contrary to all the known principles of hydrostatics. In opposition to these hypotheses, our celebrated countryman, Halley, contended that the immense deposition of water in consequence of evaporation was fully adequate to the whole supply, which opinion was confirmed by the following experiment.

He took a vessel of water, made of the average saltness of the ocean, which he ascertained by an hydrometer; and having placed a thermometer in it, he brought it by a chafing-dish to the heat of the air in our hottest summer. This vessel with the thermometer in it, he placed in one scale, which he nicely counterbalanced by putting weights in the opposite scale. After two hours he found that about the sixteenth part of an inch in the depth of the surface had escaped in vapour, and consequently, that in twelve hours, the length of a natural day, one tenth of an inch would be evaporated.

It follows from this experiment that every ten square inches of the surface of the water yield a cubic inch of water in vapour per day, every square mile 6,914 tons, and every square degree 33 millions of tons. Now, calculating the Mediterranean at 40 degrees long, and 4 broad, we have a surface of 160 square degrees, from whence will evaporate 3,280 millions of tons per day, a quantity, which renders it highly probable that the rivers may be supplied by the deposition of water raised by the process of evaporation.

EMBANKING LAND FROM THE SEA.—Henry Blyth, Esq. of Burnham, Norfolk, has been presented with the large Gold Medal of the Society of Arts for recovering 253 acres of the land in Burnham Deep Dale Salt Marsh, which, during spring tides was overflown to the depth of from five to six feet. The embankment is one mile and a half long, its base is seventy feet, height ten feet, outer slope or face, five feet to one, inner slope or back, one and a half feet to one, top five feet. The embankment includes a puddle wall three feet thick, to within a foot of the top. There is a fore ground of twenty feet between the foot of the bank and the excavation, and of thirteen feet between the bank and a drain cut parallel with it to convey fresh water to the sluice. The sluice is built of brick, on a platform of wood, with a tunnel fifty feet long and five feet diameter, with land and sea doors at the respective ends. The bank is all turfed over with four-inch flags, with the exception of the top which is gravelled. The embankment was executed under the inspection of Mr. Telford, the civil engineer.

NEW MECHANICAL POWER.—It is said that Sir H. Davy, in conjunction with Professor Millington, are engaged in constructing an engine, the moving power of which is to be derived by the expansive force of carbonic acid gas.

RECENT PATENTS.

APPARATUS FOR BOILING.—To T. Masterman, of Ratcliffe Brewery, for an apparatus for bottling wine, beer, and other liquids, with increased economy and dispatch. Sealed 19th February, 1285.

FEEDING OF FURNACES.—To Edmund Lloyd, of Fulham, Middlesex, for a new apparatus to feed fires with coal and other fuel. Sealed 19th February, 1825.

PREVENTION OF FIRE.—To Benjamin Farrow, of Great Tower Street, for improvements in buildings, calculated to render them less likely to be destroyed or injured by fire than heretofore. Sealed 19th February, 1825.

WOOL-COMBING.—To Jesse Ross, of Leicester, for a new apparatus for combing wool, cotton, &c. Sealed 19th February, 1825.

FIRE-ARMS.—To Jacob Mould, of Lincoln's-Inn Fields, for certain improvements in fire-arms. Sealed 19th February, 1825.

TO READERS AND CORRESPONDENTS.

Henry Quevedo bears too much on the fine arts for our publication.

Considering the expenses of a patent for, and the probable amount of profits upon, J. H. A.'s projected *improved scales*, we fear that the balance would not be in his favour.

Nisbett.—Mr. Parnell.—J. J.—Philo-lever.—Eugene.—H. S.—An old Friend.—and So-So (who is very *so-so*, indeed), are received.

Mr. J. L's Letters are received, and will be delivered to the right party.

W. P.—H. L.—Veritas, and an old Subscriber's communications will have early insertion.

Our other correspondents will be attended to in our next.

The next number of the Register will be published on this day fortnight, and be continued as heretofore.

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REGISTER

OF

THE ARTS AND SCIENCES.

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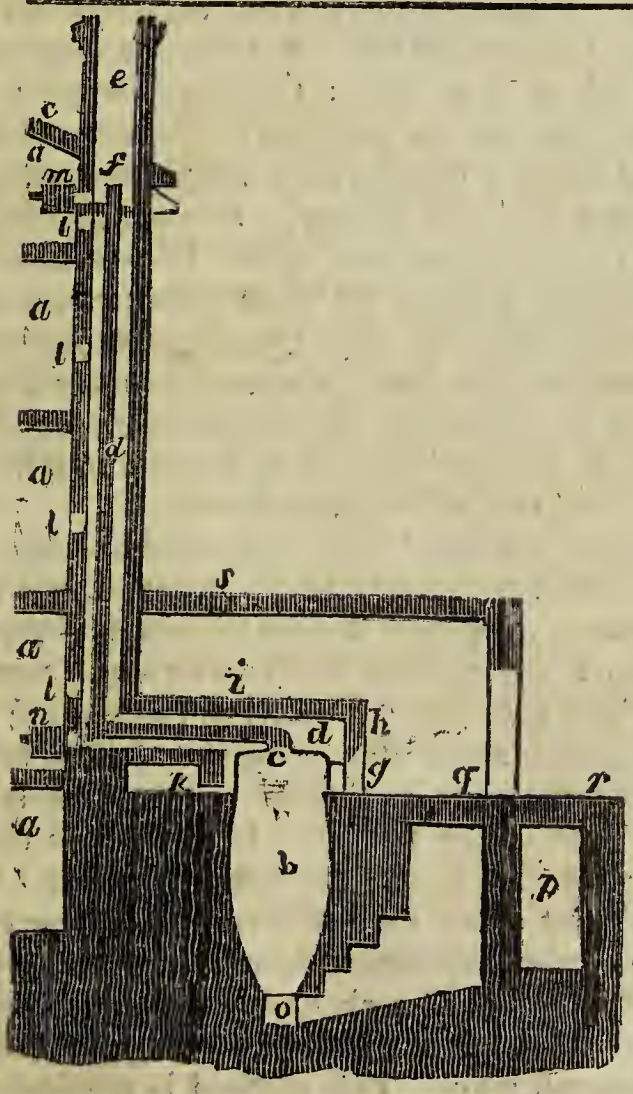
☞ *Our Subscribers will be pleased to notice the* CAUTION *given at page* 264 *of this Number before cutting it open.*

CONTENTS:

Bewley's Method of heating his Cotton Mill by means of the burning of Lime 257
Brown's Gas Engine 260
Vallance's Telegraphic Communication..... 261
British Philotechnic Society.... 269

Miscellaneous—Substitute for Leather, 271;—Bracconot's Process for making Blacking, *ib.*—Patents, Correspondents, &c.



MR. THOMAS BEWLEY'S METHOD OF HEATING AND VENTILATING HIS COTTON-MILL BY MEANS OF THE BURNING OF LIME.

THE preceding engraving is a sectional representation of a highly economical and judicious method of warming manufactories; costing

not merely nothing for fuel, but actually affording a profit above all expenses. The inventor, Mr. Thomas Bewley, of Montrath, has proved the advantages attending it by several years experience, and has received a honorary medal from the Society of Arts, for a communication on the subject; the effectiveness of the plan being certified by some of the most respectable inhabitants of the place where it is situated.

Reference to Engraving.—*a a a a* are the several rooms of the building; *b* is a kiln in which lime stones are burned; *c* a canopy, or cover of cast-iron, placed over the kiln, from which proceeds *d d*, a cast-iron pipe for carrying off the effluvia and smoke from the kiln; *e* the chimney; *f* the opening of the pipe *d* round the outside of which the chimney is well closed in. *g* is the opening into the kiln for supplying the stones, &c. and which is closed by a strong sheet-iron door. *h h* is a brick wall surrounding the canopy *e*. *i* is a covering of bricks bearing on iron bars on the wall *h*. *k* is one of the several openings at the bottom of the wall *h* for the admission of air. *l l l l* are apertures in the chimney *e* for the admission of heated air into the several rooms; these openings have registers for regulating the quantity of hot air to be admitted. *m* is an opening into the chimney *e* and is closed by an iron door: this door is only opened before setting fire to the kiln, for the purpose of cleaning the pipe *d*, which is done by letting down a rope, with a weight appended, to which is attached some straw or other matter. *n* is another opening into the chimney *e*, and closed by an iron door: this is also only used for cleaning the horizontal pipe *d*, which has here a cap or cover that it may be occasionally taken off. *o* is the eye or aperture at the bottom of the kiln, for drawing the lime. *p* an area surrounding the building. *q* a floor or stage for breaking the stones and supplying the kiln; which is on a level with *r* the yard or ground outside the building. *s s* the gable end and roof of the lime-house.

Mr. Bewley observes that "this method of heating and ventilating is peculiarly applicable to manufactories, prisons, hot houses, and all places where a steady, equable degree of heat is desired to be maintained. The lime is drawn from the kiln twice in twenty-four hours (say at morning and evening) when fresh charges of stone and fuel are applied. If a still more steady degree of heat be required, the lime may be drawn three or four times a day, and layers of stones and fuel proportionally thin put on. It is obvious that heat is kept up during night as well as in the day time, which is a matter of great importance in almost every case where heat is necessary, thereby preventing those unpleasant consequences to machinery and materials which are often the result of a change of temperature; and also the loss of time which often occurs in the mornings where fires are to be lighted in the common way. This method is particularly pleasant to the working people, especially to children, as, in cold weather, they are always sure of finding the room comfortably warm on their arrival in the mornings, and are thereby induced to an *early* attendance at their respective employments.

Another very material advantage of this plan consists in its *great*

safety: there being no possibility whatever (if the work be properly executed) of accident, or any unpleasant effluvia from, the fire, as it is apparent, from a view of the drawing, that the pipe *d d* carries off the sparks, smoke, smell, &c. nothing being admitted into the room but the air which enters at the apertures, one of which is shewn at *k*, hence passing over and about the canopy *c*, and along the outside of the pipe *d d*, it is heated to a high degree, and blows out with great violence into the different rooms at the openings *l l l l*.

Another very important matter connected with this plan of heating is, that the fuel which is most proper for use is of that description which is applicable to no other purpose, and consequently cheaper, namely, culm, cinders, &c.

But the most important quality belonging to this mode of heating rooms consists in its cheapness, or rather in its affording a profit independent of the heat. Lime is an article every where used, and always in demand: it is therefore to be presumed, there are very few situations in which lime may not only pay the cost of burning, but leave a profit on the manufacture.

For the general purposes of warming and ventilating manufactories, &c. no more heat is necessary than the superfluous heat which is unavoidably produced by the calcining of the lime-stones. The cotton mill, to which the drawing refers, consists of five rooms; the under one alone it is not necessary to heat; the rooms are about fifty feet long by twenty broad. The heated air immediately on admission into the rooms, at the openings *l l l l*, frequently raises the thermometer to 140°, but the general temperature of the apartments may be about 80°. The kiln is a small one, being only eleven feet deep and seven wide at its greatest breadth, the situation not admitting of a larger; but it would be advisable, in point of economy, to have the kiln deeper. Before the adoption of this plan of heating, a considerable sum was necessarily expended annually in fuel; but since this method has been applied, so far from the heating of the mill being attended with expense, the sale of the lime has afforded a profit, not to mention the great superiority of this method of heating to that of burning fuel in the common way.

In situations where lime-stones cannot be had, heat may be advantageously supplied by the burning of bricks, tiles, &c. in this case there ought to be two kilns, communicating each occasionally with the same chimney, so as that one may be in use while the other is in preparation. Clay may also be burned in many places for the purposes of manure with the greatest advantage.

The application of this plan, of heating and ventilating penitentiaries, &c. might be attended with many beneficial consequences; as, besides, contributing to the health and comfort of the inmates, it might be the means of useful and profitable employment, as all the operations necessary are within the compass of moderate abilities.—*Transactions of the Society of Arts.*

BROWN'S GAS ENGINE.

We extract from the British Traveller, the following interesting account of the difficulties Mr. Brown has had to contend with, in applying his valuable invention to loco-motive purposes; and we are gratified to learn that the most sanguine hopes are entertained of his ultimate success.

"It is generally known, that the first evidence submitted to the public, of the discovery of this new power, was by the exhibition of the model for raising water directly into the vacuum cylinders, and thence discharging it upon an overshot wheel—the exact power of the vacuum being measured by a guage, in which the column of mercury was raised to the height of twenty-two or twenty-four inches, indicating about ten pounds pressure to the square inch. The inconvenience, however, of a water-wheel in its application to a coach, suggested the necessity of employing pistons, and as I have understood the cause of delay has originated in the hitherto not totally unsuccessful, but certainly the unsatisfactory trials that have been made in the mechanical adaptation of the power. It would be tedious to enter into a detail of the numerous causes of this want of success, or, of the great expense in which they have involved Mr. Brown, and the great perseverance with which he has combatted them— causes, which perhaps, could only be discovered after the great labour and delay of actual trial, to prove only in the end unsuccessful. I will here mention one or two only, which will give some idea of the remainder. An engine was at first constructed, wherein the pistons were to move directly in the vacuum cylinders. A large valve in the piston was to serve for the ejection of the incombustible part of the former contents of the cylinders, viz. the nitrogen, by the caloric, or matter of heat, evolved during the combustion of the gas; but it was not until after an actual trial was made, by the erection of a working engine, discovered that the valve in the piston could not be made large enough to afford that free facility for the escape or ejection of the nitrogen, necessary to obtain the rapidity of motion required, or even the full power that, under more favourable circumstances, a better vacuum would have afforded.

"This plan was therefore abandoned; and it was determined to work pistons in cylinders distinct from those in which the vacuum was to be effected, which would allow the latter to be entirely open at top while the combustion and ejection of the nitrogen gas was effecting, and this removed the objection to the engine first constructed. The vacuum now made was extremely effective, and was to operate on the pistons in the separate cylinders by a communication that opened between them. But it was not until this moment discovered, that a new source of loss of power existed in this second construction, arising from the elastic nature of the air to be abstracted from under the pistons in the separate cylinders. If we imagine the cubic contents of the vacuum and piston cylinders to be just equal to each other, and that a vacuum be made in the former, which we may suppose equal to ten, and the communication opened between the two cylinders, the elastic nature of the air to be ab-

stracted from the piston cylinders causes it to expand, and form an equal density throughout both cylinders.

"The power, therefore, which we suppose equal to ten, in one cylinder, becomes equalised in both, and now exerts a pressure of only five on the piston from which the work is to be obtained. Here then was an enormous loss of power, which induced the ingenious and persevering patentee, not at all dismayed, to abandon this construction, for a third, fourth, and even further trials again.

"Mr. Brown has at length adopted a plan which bids fair to combine some new advantages, with a complete removal of all the difficulties that have hitherto arisen, and which, I am happy to understand, has received the unanimous approval of Dr. Birkbeck, Professor Millington, and others of our most ingenious and eminent mechanics and engineers, who have inspected it.

"It is by filling the piston cylinder with a non-elastic fluid, such as water, which is made freely to pass from one cylinder into the other, and which, instead of expanding and forming an equal density in both cylinders, and affording an available power equal to five only, will be wholly drawn into the vacuum cylinder, and thus give a power of ten in the piston cylinder.

"In its application to the carriage, another ingenious contrivance of Mr. Brown's, it will give increased facilities. It is a wheel of small diameter, difficult to describe intelligibly, without the aid of drawings, but whose axis will be the axle of the carriage, and which must revolve with the wheel. This wheel revolves in a circular case or box, and as the water is drawn into the alternate vacuum cylinders, with the full force thereof, it is made to act on the periphery of the wheel, thus giving motion to the axle of the carriage.

"This ingenious contrivance, it is supposed, will do away with pistons, crank, and fly wheels, and add much to the simplicity of the engine. It will likewise add much to the facility of regulating the velocity and reversing the motion."

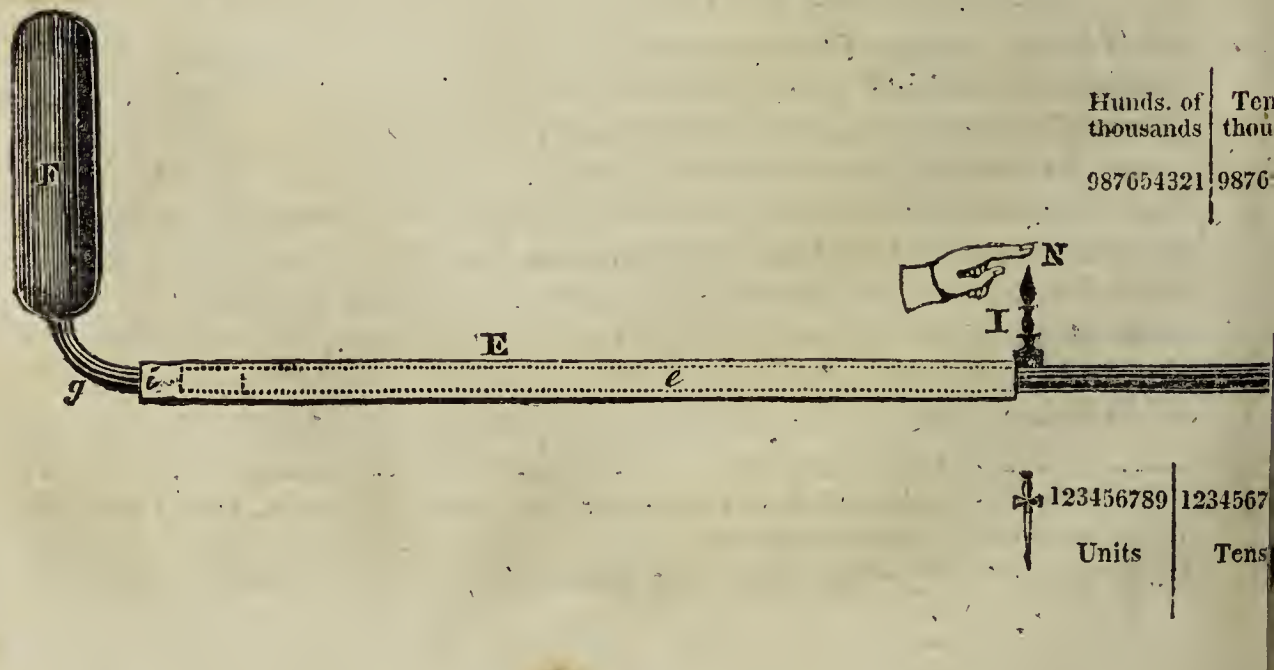
TELEGRAPHIC COMMUNICATION.*

The projector of the new mode of conducting Telegraphic Communication, which forms the subject of the present paper, has already rendered himself conspicuous by a plan very recently proposed by him of conveyance *in vacuo*. We believe, that although Mr. Vallance has been very heartily laughed at by many good-natured people, his notions have nevertheless received from others more attention than they have cared to avow; we know not whether the present proposal will meet with similar treatment, but we think it due to him and to the public to give a rather detailed description of it, in order to bring the thing to a proper point of view. It is quite

* Description of a Method of Telegraphic Communication, which will be equally efficient during the most Foggy Weather and Darkness, as in Daylight and Clear Weather. By John Vallance. Lond. Wightman, 1825.

evident that he has given the subject a matured consideration, and anticipated the difficulties and the objections which may be raised upon it, and fairly and candidly combatted them; and although those who are habitually accustomed to take a superficial view of whatever may be brought before them, will, no doubt, at once pronounce it as impracticable, we still hope that less hasty persons will give to it the consideration which most sincerely we think it deserves.

Telegraphic communication, (says Mr. Vallance,) has hitherto been a mean of intercourse, that was serviceable only during those portions of the enlightened half of the twenty-four hours, when clear weather admitted of uninterrupted vision, for a distance of about ten miles. It has been frequently proposed to remedy this disadvantage (so far as related to the absence of light, that is,) by nocturnal telegraphs; for the lamps of which gas seemed so admirably adapted. But as this would do nothing toward lessening the interruptions which wet and foggy weather occasion, it has not been considered worth while to incur the expense of it; and as it has also been supposed impossible that those interruptions could be obviated, we have sat down under the impression, that communications, rapid as are those of the telegraph under favourable circumstances, must remain dependant to a degree, that would ever prevent the principle from being rendered available to the purposes of commercial and domestic communication. But this impression is equally erroneous with that of the Spanish courtiers, when they observed, that it was "impossible for any one to make the egg stand on its smaller end;" there being a well-known principle, by the aid of which, information may be communicated equally well during darkness, and the most foggy weather, as in day-light and clear weather. The putting this principle in execution, will, to be sure, be incomparably more expensive than laying down a line of telegraphs. But as the revenue it may be made to bring in will (to use M. Dupin's observation relative to our domestic policy) render this expenditure but an additional instance of that "economy, well understood, which knows how to make sacrifices bordering almost on prodigality, in order to reap afterwards with



usury; the fruits of its advances," the amount of it in no wise diminishes the attention the principle deserves.

It has long been known, that an incompressible liquid, confined in a pipe, might be caused to move through the whole length of that pipe, by operating on it at either end, whether the pipe was one mile or one hundred miles long.* But although this has long been known, and although it offers a mean of symbolic intercourse, which would be alike independent both of darkness and cloudy days, yet has it been unthought of as a principle of (what has been hitherto understood by the term "Telegraphic Communication," but which would, in this case, be) instantaneous transmission.

It is, however, no less available for having been unpractised, than railways are, because they did not become general for nearly a century and a half after they were first used. Accordingly it is proposed to bring the principle into practice in the following manner.

A pipe, of small calibre, is to be laid from one to the other of the places between which (as hitherto termed) telegraphic communication is to be effected. For a reason which will be subsequently stated, this pipe will be so small as to admit of its being put together in a way that shall effectually prevent leakages in the joints. This pipe is to be filled, and kept constantly full of water, by apparatus which both completely empties it of air, and guards against (or rather counteracts) contraction and expansion. Each end of this pipe is connected to apparatus, which will cause any movement of the water inside it, to act on and move a hand. This hand may point out and indicate letters, or numbers, or words, painted on a dial-plate; though it will be better to cause it to indicate them when placed in a line.

In connexion with telegraphic apparatus, is always understood a vocabulary, connecting the symbols with certain meanings. The

* Bossut proved this for a distance of three miles, above half a century back. The Edinburgh New Water Works prove it for a distance of nine miles; and the line of pipe by which the London Sea Water Bath Company intend to bring the salt water to town will be thirty-five miles long.

principle of this method will admit of either letters, numbers, words, or sentences being used. But for illustrating it, a dictionary on Colonel Macdonald's principle will be referred to; with the exception, that instead of being numbered in classes of 999 each, the words and sentences will be numbered consecutively. The sentences of service will also be much more numerous, and more exclusively adapted to correspondence of a commercial nature.

This is the principle of the proposed method. To explain how it is to be put in practice reference must be had to the frontispiece, which is intended to illustrate the principle of this method of transmission. A A are supposed to be the ends of a pipe, extended between two distant places, London and Dover, or Calais and Paris, for instance; and the delineations attached to those ends, represent the apparatus by which intelligence is communicated. This pipe is filled with water. Water, in a pipe, is caused to assume the shape of a solid cylinder, or rod; and if it be forced strongly forward from one end, its mobility and incompressible nature will cause it to push against the other end, with a force no metal rod of equal diameter could bear.* B B are cylinders connected to the ends of the pipe. In each of these cylinders is a piston, as shewn by the dotted spaces *a a*. These pistons work in these cylinders as in a pump barrel. The dotted line *c c* and *d*, represent rods attached to these pistons. These rods are long enough to extend beyond the cylinders, as shewn by D D, and go into other cylinders, E E, as shewn by the dotted line *e e*, where they are attached to other pistons *i i*. These cylinders, E E, are similar to the others B B; they are connected to air

* When caused to operate in this way in the hydraulic press, water forces forward with a power that would raise a perpendicular column of it five miles high. Now it has been proved, that a perpendicular column of water about five feet high will move a horizontal column a mile in length. Should these data be calculated on, force pumps, such as those of the hydraulic press, would appear to be capable of moving a horizontal column several thousand miles long. And let friction operate as it may, it will prove no impediment to the comparatively short lengths required for the purpose in question.

vessels F F, by the pipes *g g*, in which air is condensed (by pumps it is not necessary to shew,) to whatever degree may be necessary. In two parallel lines above and below the piston rods, D D are the Arabic numerals, in six divisions; each division containing all of them excepting the cipher; and so super, and subscribed, as will admit of any unit, any ten, any hundred, any thousand, &c. &c., being separately designated, by causing the indicator, I, (which is attached to, and moves with the piston rod), to move to, and stop at it. These figures are to be any convenient distance (suppose a foot) apart; and must be read in the direction designated by the hands pointing to the 9 at each end; that is from high to low. These hands are to be understood as the commencement of the scales; and the motion of the indicator, when in operation, is always to be from them, until it arrives at the end of each scale, (or line of figures,) when it is to be moved back again; and when indications are always to be understood, as ceasing with reference to the upper row of numerals, and commencing on the lower row. This, however, is regulated by the indicator itself. For whenever it arrives at the space marked + apparatus operates to reverse its direction, and cause it to point downward instead of upward, as shewn by the dotted representation of it. This apparatus operates again, to cause it to point upward also, when it arrives at the other end; so that the indicator itself always tells which line of figures is referred to. Connected to the piston rods, D D is machinery, by which they can be moved backward or forward, as may be desired; though this machinery is omitted, that the figure may not be encumbered. With an apparatus of this kind, at both (suppose) London and Dover, the pipe between is filled with water. This filling is so regulated by machinery, which it is unnecessary to describe here, that every particle of air is excluded from the pipe. When it is full, air is condensed in the air vessels, sufficiently to cause the spring of that at the end of the pipe which may be lowest, exactly to counteract the effect of the pressure of the condensed air, and the superior altitude of the water at the highest end; and also to cause the water in the pipe to move from each end, whenever the

piston at the other end of the pipe is moved back so as to allow of it. There is also an apparatus for counteracting expansion and contraction; so as to keep the indicator always at the commencement of the scale when not in operation. With things thus arranged, suppose the piston at the London end of the pipe to be moved forward, for the indicator at that end to designate or point to 9 in the class of units; and then after remaining stationary there a moment (that it may be evident what figure is referred to) to be moved onward, so as to pass the whole of the figures, or extremity of the scale.

By the agency of the mobile, but incompressible* liquid with which the pipe is filled, these motions will be communicated from one to the other end of it, with a rapidity almost instantaneous,§ and the piston at the other end moved forward, first, till it indicates 9 in the class of units, and then till it has passed the extremity of the scale; when the apparatus by which its direction is reversed, would opperate, and cause it to point to the lower instead of the upper line of figures. As soon as this is done, those who attend the apparatus at Dover, note 9 in the units' place of a book, ruled in columns in the margin, to admit of figures being placed under each other as in learning addition. Meanwhile, the piston at the London end has been moved back again, to cause the indicator there to point to 9 in the class of tens, on the lower line of figures. The moment the backward motion of that piston admits of the water being moved that way, the piston at the Dover end, being acted on by the condensed air in the air vessel, drives the water as far as the retiring of the piston at the London end permits; and 9 in the class of tens is in consequence designated at Dover. 9 in the tens' column (90 that is) is accordingly noted there under the other 9. The London piston has, in the meanwhile, been moved to the termination of the scale at that end; and as the operation of the condensed air on the

* Incompressible, that is, under the pressure to which it would in this case be exposed.

§ It is estimated, that impulses are communicated through water at the rate of between 4 and 5000 miles an hour.

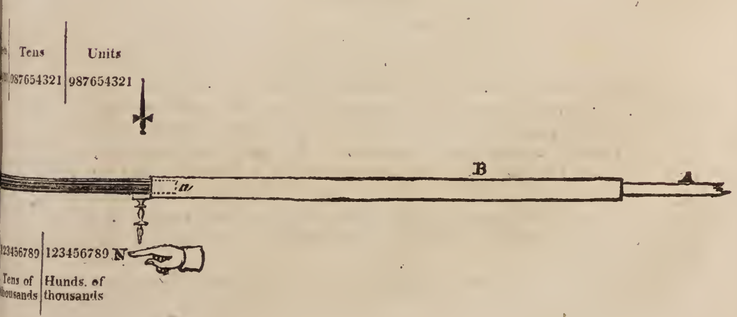
Dover piston causes it to move correspondingly, the direction of each indicator becomes reversed as before, and they point to the upper line of figures again. The London piston is now moved forward again, to indicate 9 in the class of hundreds; when an effect similar to what has been described takes place, and 9 in the column of hundreds (that is 900) is noted under the other figures at Dover. The reversing the indicator taking place as before, and the London piston being then moved back again, for the indicator to point to 9 in the class of thousands, the condensed air operating as before, causes the water to go back in the pipe, till the indicator at Dover points 9 in the class of thousands, which is noted (9000) under the other figures. These operations keep on, until 9 in the class of tens of thousands, (90,000, that is,) and 9 in the class of hundreds of thousands, (900,000, that is,) are noted at Dover; when we will suppose the movements of the piston at the London end, and consequently the transmission, to cease. The people at Dover finding this, turn with the list of numbers they have noted, (and which stands thus,

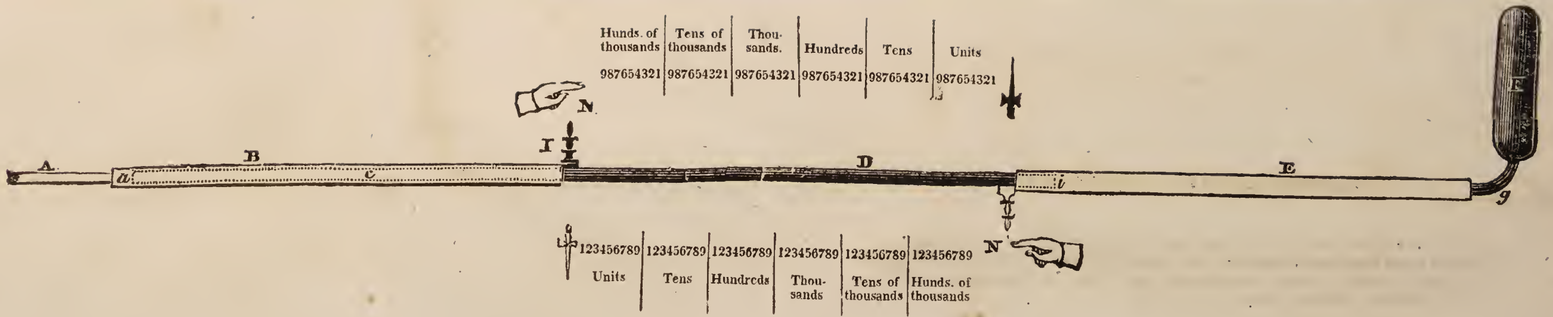
9
90
900
9000
90000
900000

to their vocabulary, to ascertain the import of the communication. The letters, words, or sentences, referred to by the numbers, being written in a line with them, are copied (and we will suppose them to intimate) thus,

9 Stop
90 the packet
900 let no one embark
9000 police officers
90000 are coming
900000 more in a few minutes

The necessary directions are accordingly given, and the promised communication is waited for. Supposing it to run thus,





☞ The lower part of this page and the next (265) are to be divided along the ruled lines, and from line to line, with a pair of scissors, and being then opened its whole length, the engraved representation of the subject will be under the descriptive account.

888888
88888
8888
888
88
8
7
77
777
7777
77777
777777

it is executed in the following manner. The indicator being moved to 8 in the class of hundreds of thousands is stopped there, to point it out; it is then moved onward to 8 in the class of tens of thousands, and stopped there, to point it out; it is then moved to 8 in the class of thousands, and stopped there to point it out; and this being done for every figure in the number to be indicated, eights are written one after the other till the number 888888 is intimated, and the indicator has arrived at the end of the scale; when its direction and motion being reversed, 8 in the class of tens of thousands, in the lower line of figures, is first pointed out; then 8 in the class of thousands; and so on till 888888 is indicated; when the other numbers are designated in the same way; the motion of the indicator regulating how they are to be written down, whether over each other, as in the first instance, or in a line as in the present. For, every figure stopped at, while the indicator is moving from end to end of the scale, is to be written in line, as in the case of these eights, and that indication is to be understood as referring to the letter, or word, or sentence, placed opposite to 888888 in the dictionary. But when the indicator changes its direction, it is always to be understood that another number is going to be indicated; and that such number must be written (in its place of units, tens, hundreds, or whatever it may be) under the preceding one. Supposing the communication last referred to, to cease when the number 777777 was designated, the vocabulary at Dover would be referred to again, to know what it implied; and as the words and sentences placed against those numbers would (we will suppose) read thus,

888888 A Frenchman,
88888 named
8888 Do-
888 lo-
88 ret
8 has defrauded
7 Messrs.
77 Rothschild
777 to a great amount
7777 detain him
77777 when he is secured
777777 let the packet sail

the necessary measures would be taken. Farther to illustrate the principle, we may suppose that a communication in reply to this, should in a short time be made from Dover to London, saying, that they find Doloret sailed by the yesterday's packet; and inquiring, should they send a dispatch across to the Calais Telegraph, that he may be arrested on his arrival in Paris; and concluding, if they are, to let them be replied to in the affirmative, that the boat may be got ready, while the particulars are being transmitted, for them to prepare the dispatch.

Such is the operation of this method of Instantaneous Transmis-

sion. Were it to be put in action between London and Dover, and Paris and Calais, the two capitals might communicate in the period required for crossing the channel; and the over-night's news of each be known in the other every morning.

(To be continued).

BRITISH PHILOTECHNIC SOCIETY.

It is with feelings of the deepest satisfaction that we announce the formation of a society of this nature. Most of our readers will no doubt remember, that about a twelvemonth ago there appeared in the Register of Arts an article "*upon the necessity of protecting poor but talented artisans,**" and we cannot conceal the pride and pleasure we experience in being the first to have urged public attention to a subject so important. Actuated by the same motives, and influenced by the same desires, a body of gentlemen have at length come forward, whose rank and character in life are well calculated to secure that interest and support which an undertaking of this nature so immediately requires. The plan which it is proposed to adopt is precisely similar to that which we then recommended, and that upon the grandest scale. In the mere infancy of an institution like the present, it is not of course to be expected that the full details of a plan can at this moment be gone into, or disclosed: this would augur an improvident and unwary haste, in which the society know too well the magnitude of the object it is engaged in to undergo. In so grand and national a concern as it is intended this shall be, these details will require deep thought and matured reflection; and we have all to hope from the talent now employed in its perfection.

In the paper of "Important Considerations" which has been published, ample reasons are given (if any were wanting) for the formation of such a society; and, after rapidly noticing the difficulties with which inventors are too generally beset, it proceeds in this way:—

A Public Institution is the only intervenient by which universal information, combination of intellect, and ample mechanical facilities, can be accumulated to any sufficient extent, for the purposes of beneficial and general dissemination among the ingenious. Such is the grand object of the "British Philotechnic Society," and surely such a society must prove invaluable to the country, from the prodigious impulse it will create, particularly with Mechanics and Manufacturers. The great benefits then to be derived from its establishment, independently of the pecuniary aid it will afford, appear to be,

First.—The best advice in every branch of science, through the medium of the ablest professors, engineers, and men of talent, that they may ascertain in the outset the truth or fallacy of the object in view, and to recommend the proper course of operative trial.

Secondly.—The necessary accommodation of works, laboratories, &c. under the superintendance of an experienced working engineer, wherein may be conducted with every possible degree of secresy, all the requisite preliminary experiments, and where working models may be constructed, so as to ensure a full investigation of every fact connected with the subject submitted for trial, and by which only actual results can be arrived at.

* Vol. I. pp. 73-189.

The difficulties which now exist in procuring with facility the opinions of scientific men, and which have been already adverted to, will be entirely removed by the manner in which those gentlemen will be connected with this society; and by the systematic arrangements which will be made, to prevent their time being unnecessarily occupied: besides which, the feeling which now actuates them individually, in regard to what the world may say of any opinion given upon a subject in which they have been consulted, will be done away, by the circumstance of their advice being hereby given collectively; because, generally speaking, they will have to co-operate, and more than one professor must be advised with. It is perfectly evident that such a co-operation, one so essential, and desirable, can only be attained by a society formed for the purpose.

In conducting the preliminary trials, secresy and dispatch are of the utmost consequence. Now it has been proved that neither of these can be secured in the public factory of any engineer. It is no less clear, that it will never answer the purpose of any individual to form an establishment merely for trying private experiments; and it is as certain that without a full practical, or in many cases, a series of experiments. or some sufficient satisfactory trials, inventions can never come to a successful result. An institution then is the sole medium through which genius can be assisted perfectly, and as it deserves, or to such extent as to render it eminently beneficial to the public.

Much more might be said, many more arguments might be urged, and facts adduced, in favour of this plan; but it would infinitely exceed the present limits. It is trusted, however, that those particular points which have been selected will suffice to lead our readers to more minute consideration of the subject, and a just appreciation of its merits.

From this statement will be seen the main objects of this society; but although noticed in general terms, it must not be supposed that they are to be at all restricted or confined. Its views are strictly national, and being such, no parts of the kingdom, however distant, are to be non-participant in the benefits which cannot fail to result. Persons of eminence and character in matters of art and science, and whose names are of high standing as mechanicians and philosophers, in whatever parts of the country they may be resident, are to be engaged by and connected with the society. To them the discoveries and projects of provincial artificers are to be submitted; and these gentlemen, after due consultation and advice with the inventors, will communicate with the general board in London, upon every plan divulged to them, where the merits of the project will form the subject of the gravest deliberation. The members so engaged will be individuals whose acknowledged honour and probity will scan all confidence, and avert all suspicion; and the complete and perfect secresy which will thus be secured to the inventor, will form one of the best characteristics of the society.

The objects of this society will be yet more extended. It is proposed to open channels of communication with every quarter of the globe, and to offer its patronage and support to persons of all countries. Correspondence will be established with foreign Universities, and professors appointed to receive and submit to the Parent Institution the claims of those who shall seek its assistance. The objects of these claims will be fairly canvassed and discussed, and where approved, the advantages to be derived from the discovery will be secured to the inventor by patent. In this way will be effected a

benefit of vast magnitude, alike important to the inventor and to the public. From its connections and internal resources the Society will possess an influence which no individual could ever possibly attain; and society will be enriched by the perfected and realised ideas of ingenious men, which, but for its succour, must needs have slept for ever.

We are well aware, however, that objections may be raised and doubts be entertained of the practicability of such a scheme, but such doubts and difficulties will only be entertained by such as may happen to be ignorant of the views and of the nature of this society.

The pecuniary *capital* (we wish that we could find a less abused word) will of necessity be great; but although it must be raised by means similar to those which have of late been resorted to for many equivocal purposes, we hope that the noble and disinterested views of the society will not be the less appreciated. We pledge ourselves to this, that it is not to be levied for the stock market; and we sincerely trust that no individual will come forward whose object is other than the protection and encouragement of one of the best bulwarks of the kingdom. We will give more information upon this interesting matter in proper time, and hope to engage the support of such of our readers whose names and interest are influential. We ourselves know that men of the most exalted talents in the land have already come into and engaged their interest to perfect the views and objects of the society; and we do not hesitate to predict that, by such means, will be raised one of the proudest temples ever erected to the votaries of science and the arts.

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

New Substitute for Leather.—An Austrian patent has been granted to a Dr. Berhnland, of Larris, in Germany, for the discovery of a means or process by which may be obtained from certain animal matters, (of which no use has hitherto been made) a substance exactly resembling leather. The material is prepared or brought to a fluid state, and *cast*, as it were, into boots and shoes, as well as other useful articles.

A considerable number of persons are employed at Gumbold, near Vienna, in this new species of manufacture.

M. Bracconot's Process for making a superior and cheap Blacking for Leather.—Those illustrious professors of the black-art, Messrs. Day, Martin, Warren, Hunt, and Co. are now likely to be eclipsed by M. Bracconot, the eminent French chemist; he has discovered that a composition superior, as well as infinitely cheaper, may be made from the following formula:

Take plaister of Paris, passed through a fine silk sieve, 100 parts, lamp black 25 parts, malt 50 parts, olive oil 5 parts. Let the malt be first macerated in water nearly boiling to obtain its soluble particles. Then mix the plaister and lamp black in a basin with that liquid, and when evaporated to the consistency of paste, mix the olive oil with it. A little olive oil or lemons may be added to perfume it.

Thus, the sulphuric acid considered so essential in the manufacture of good blacking is obtained in the plaister of Paris (or sulphate of lime); the colour in the lamp-black; the mucilage in the malt; and the supple-giving quality in the oil.

RECENT PATENTS.

INK STANDS.—To D. Edwards, of King Street, Bloomsbury, writing-desk maker, for an inkstand, which by pressure causes the ink to flow for use. Sealed Feb. 26, 1825.

FIRE ARMS.—To Joseph Manton, of Hanover-square, gun-maker, for certain improvements in fire-arms. Sealed Feb. 26, 1825.

PROPELLING VESSELS.—To Lieut. W. H. Hill, of Woolwich, for certain improved machinery for propelling vessels. Sealed Feb. 26, 1825.

PIANO-FORTES.—To G. A. Kollman, of the Friary, St. James's Palace, for improvements in the mechanism of piano fortes. Sealed Feb. 26, 1825.

FIGURED LACE.—To John Heathcote, of Tiverton, Devon, for an improved method of producing figures upon lace. Sealed Feb. 26, 1825.

LIFE BOAT.—To John Bateman, of Upper-street, Islington, for a portable life boat. Sealed Feb. 26, 1825.

TO READERS AND CORRESPONDENTS.

Mr. R——l begs to inform A. R. K. that he has received his note, which from a material part being illegible, he is unable to reply to.

Mr. Russell's Letter in reply to an anonymous correspondent, came too late for insertion in this number, but will appear in the next.

Communications received from A. T.—Silex.—W. W.—E. Bartlet—and A Constant Reader.

H. L.'s and W. B. L.'s favors will be inserted in the next number.

[ADVERTISEMENT.]

Canal Gas-Engine Company.

To Engineers, Mechanics, Artizans, & Others.

At a Meeting of the Provisional Committee, held on Friday, the 18th day of March, instant,

It was Resolved,

THAT a Premium of ONE HUNDRED GUINEAS be given for the best model that can be successfully applied to adapt MR. BROWN'S PATENT GAS-VACUUM ENGINE to the purposes of Boat and Barge Navigation, such model exemplifying the power when applied to the head, stern, or sides of the vessel, both in shallow and deep water as in Canals and Rivers, and also that a premium of FIFTY GUINEAS be given for the *second* best, and TWENTY-FIVE GUINEAS for the *third* best models.

Persons wishing to view Mr. Brown's GAS VACUUM ENGINE for the above purpose, may apply for cards of admission, one day previously, to the Secretary, MR. JAMES FLORANCE, No. 33, Finsbury Square: and persons sending models are requested to place some motto on a conspicuous part thereof, corresponding with a motto in the letter or envelope containing the name and address of the candidate.

Models to be sent to MR. JAMES FLORANCE, on or before Saturday the 30th day of April, next, as the Provisional Committee will meet on the 2nd of May to determine on the merits of those which may be so forwarded.

By order of the Provisional Committee,

JAMES FLORANCE, Secretary.

33, Finsbury Square,
26th March, 1825.

Printed for and published by GEORGE HEBERT, 88, Cheapside; to whom all Communications (post paid) for the EDITOR are to be addressed—and Sold by SHERWOOD, JONES, and Co., Paternoster Row; SIMPKIN & MARSHALL, Stationers' Hall Court; and may be had of all Booksellers in Town and Country.

Printed by T. H. Coe, Little Carter Lane, St. Paul's.

REGISTER

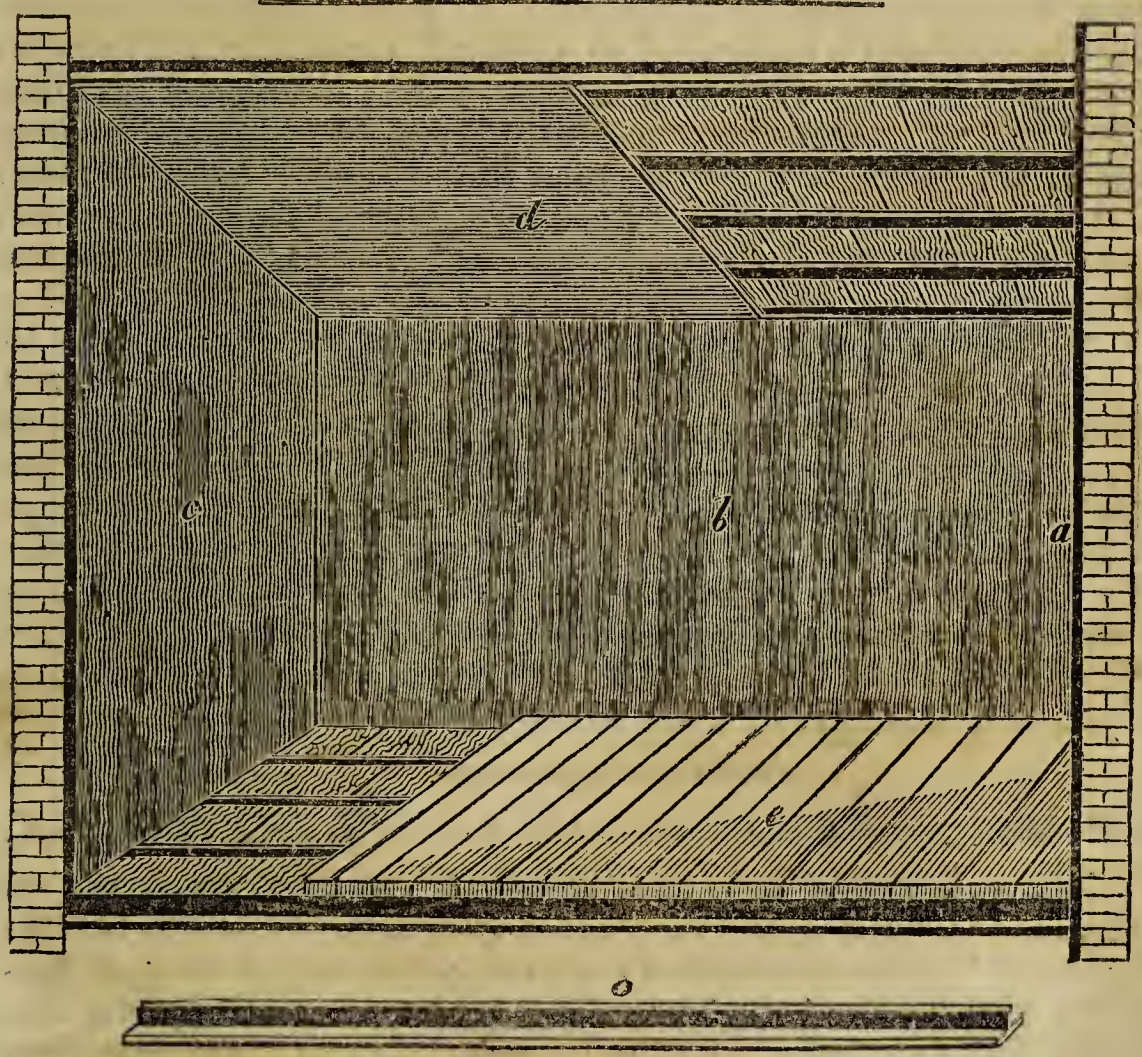
OF

THE ARTS AND SCIENCES.

No. 42.] SATURDAY, APRIL 23, 1825. [Price 3*d*

CONTENTS:

Farrow's Patent Fire-proof Houses 273
Mr. Bromley's Portrait of Mr. Abernethy 274
Jeffery's Method of Condensing Smoke, Metallic Vapours, &c. 275
Vallance's Telegraphic Communication (continued) 276
Improved Centrifugal Check-Hooks 279
Improved Workmen's Tools.... 280
Proposed New Power 283
Russell's New Power Engine .. 283
Church's new Boring Instrument 285
Miscellaneous—Lapidaries' Work, 285;—Comets, 286—Amputation, *ib.* Indian Chica employed in Dyeing; *ib.* Clock Work, *ib.*—Rearing of Calves by Fiorin Tea, *ib.*—Great Rain at Manchester, in 1824, 287,—Horticulture, *ib.*—Diorama, *ib.*—Moveable Keels, *ib.*—Patents, Correspondents.



FARROW'S PATENT FIRE PROOF HOUSES.

THE above is a perspective view of Mr. B. Farrow's * model for a patent fire-proof building, erected in Mark Lane, for public inspection.

* Mr. Farrow, Ironmonger, 18, Great Tower Street.

a, *b*, *c*, are three brick walls forming the sides of an apartment, the front or fourth side being removed to shew the interior; *d* is the cieling, and *c* the floor. Part of the cieling is left uncovered as well as the floor to exhibit their construction. The joists are of wrought iron, one of which, represented at *o* in the separate figure, shews that they are formed with a sort of flange on each side, upon which are laid, from joist to joist, a series of flat stones, and of such a thickness, (from 2 to 2½ inches) as to lie flush with the upper edge of the joists, forming a level floor of stone, interlined with iron; in which state it may be used, or covered with boards, as shewn in the engraving.

The annexed additional particulars which we have been favoured with by the patentee, being sufficiently explanatory of the rest of the invention we give them verbatim.

"The ends of the joists being turned down are let into a bond stone laid upon the walls, and run with lead; which with the weight of the walls continued upwards, takes off the elasticity of the iron, so as to enable them to bear almost any weight, and ties the walls together in such a manner as to render it impossible for them to separate. The boarded floors are grooved into the edge of the joists about half an inch, and when dowled will require very little fastening down; but where it is necessary, a stub is let into the stone floor, and screwed to the edge of the board; there are, therefore, no nails necessary, nor any other fastenings visible when the floors are finished.

"The under part of the stone is stabbed or made rough so as to form a good key for the cieling, therefore no laths are necessary, and the whole floor occupies no more than from four to five inches in depth: the roof is the same, and being covered with mastic laid upon stone, it makes the cheapest roof ever invented, with the advantage of being fire, air, and water-proof. The patentee has laid a portion of a floor, 24 feet by 16, only 4 inches in depth, which is as firm as a rock; the remaining part, which is composed of wood girders and joists, occupies 22 inches, so that there is a saving of 18 inches in depth, with considerable extra strength and durability."

MR. BROMLEY'S PORTRAIT OF MR. ABERNETHY.

This specimen of consummate skill and perseverance is now on the eve of completion, and will be shortly ushered "into this Breathing World." in exquisiteness of engraving and beauty of design it surpasses most works of the kind. There is no effort at display; Mr. Abernethy's fame being sufficient to render every line interesting and intelligible to posterity. While science lives and records last the annals of this age will enroll his name the first in rotation, as in eminence.

The plate is of large folio size. The original is represented standing in a thoughtful attitude, the prolapse of the upper eye lid and general relaxation of the muscles of the face are displayed in a most masterly manner. The hair and dress are remarkably well conceived, easy and natural: on the whole, it is a fine specimen of the present

state of the art, and a repeated instance of Mr. Bromley's genius, which it is to be hoped may elicit that patronage which his industry and perseverance merit. It is impossible for the most illiterate person, were he trained up in the confines of a desert, to look upon such a portrait as this and not pronounce it the representatation of a wise and ingenuous being: it contains never dying marks of the genius of its original: the artist has realized an observation I have heard often from the physiologist—he has delineated the mind and "bodied forth" the touchless soul in a substantial form. 'Tis Abernethy himself! The curtain behind the figure occupied nine months in execution; lines have been drawn in every direction; it exhibits the most intricate mesh work, and gives some idea of the extreme capillary division of arteries in the human body. This plate has consumed ten years in completion, an equal space of time with the siege of Troy, and the composition of Homer. But what a contrast in the object in view! instead of recording the actions of the most relentless chief of history, it stands a memorial of a very eminent modern adorned by philosophy and adorning it in return, and celebrated for a life of usefulness and public benefactions. With what satisfaction will the profession hang up this trophy at the side of the immortal Hunter!

A STUDENT,

March 26th, 1825. *Bartholomew's Hospital.*

MR. JEFFERY'S METHOD OF CONDENSING SMOKE METALLIC VAPOURS &c.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"Having read with much interest in your 39th number, the account of Mr. Chapman's ingenious method of consuming the smoke of furnaces, it has occurred to me that a brief description of Mr. Jeffery's plan for the condensing of smoke and metallic vapours, should have a place in your estimable Journal, I therefore beg leave to send it to you for that purpose, should you agree with me as to its merits.

"The construction is so extremely simple that I believe I may venture to describe it without a drawing. The vapour from the furnace ascends a perpendicular flue as usual; the orifice at the upper end of this flue is closed, so that the smoke cannot there escape; the flue is therefore made to turn off horizontally near to the upper end, and to enter another perpendicular flue (parallel to the before mentioned); on the top of this second perpendicular flue, is placed a cistern of water from which is constantly discharged a shower of water, that carries down with it and condenses the smoke and other sublimed matter (entering it from the horizontal flue) and all runs out together in the state of black water. *The shower of cold water creates a strong current of air which conducts the smoke into the descending flue.*

"Yours, &c.

"W. B. L."

TELEGRAPHIC COMMUNICATION.

(Concluded from page 269, Vol. 2.)

The objections that will be made to it, are;—First, that the water will be liable to be frozen; rendering the apparatus inoperative, and perhaps bursting the pipe. Second, that should any air chance to remain in the pipe, it would so contract and expand, as the movements of the piston increased or diminished pressure, that the indications of the hand or pointer would be rendered erroneous. Third, that the expansion and contraction of the water, from being warmed in summer and cooled in winter, will have the same effect. Fourth, that the momentum of a column of water in a pipe, is proved by the hydraulic ram to be very great; and that it must necessarily act with great force on the pistons, to the deranging their indications. Fifth, that it will be too expensive ever to be put in practice.

To the first of these objections it is to be replied, It has been proved by experiments made in lat. 56° 10′ N. by keeping thermometers fixed in the ground at various depths, that frost does not penetrate so deep in the earth as a foot; that at the depths of one, two, and three feet, the lowest temperature, during the two years the observations were continued, was, at one foot, 33°; at two feet, 36°; and at three feet, 39°: while the highest was, at one foot, 35°; at two feet, 52.5°; and at three feet, 52°. By placing the pipe two or three feet under ground, therefore, not only may frost, but also (were there no other way of doing it) might expansion and contraction be guarded against.

To reply to every objection that could be urged in this particular, it may, however, be observed, that, as ten miles of pipe may be emptied or filled in as many minutes, frost might be guarded against, even were the pipe above ground.

To the second, it may be replied, that by means of the valve used to clear long conduit pipes of air, this pipe may also be cleared of it; and when once cleared of air, there will be no fear of its ever getting in again.

To the third. It has just been shewn, that placing the pipe two or three feet under ground would of itself prevent expansion and contraction. That a remedy, admitting the possibility of inefficiency as this does, may not, however, be depended on, provision will be made as follows:—

Connected to the pipe at each end, will be a small pump, by which water may be forced into it; and a cock to let some out of it, whenever necessary. The duty of those who attend Telegraphs is, to watch the other or others with which they communicate so incessantly, as for the signals to be transmitted to the next station, the moment they are made at the preceding one. Instead, however, of looking at an object miles off, by a telescope, those who attend this method of transmission, will have to watch the indicator. In watching it, any distance which the expansion or contraction of the water in the pipe should cause it to move from the place it is to point to, when not in operation, (the zero of the scale, that is) would be im

mediately perceived, even were it to be no more than the tenth of an inch. The moment the least deviation is perceptible, a quantity of water, sufficient to rectify it, and bring the indicator back to its precise position again, is forced into, or let out of the pipe, as the case may require, by the pump or cock.

Erroneous indication, from the expansion or contraction of the water in the pipe, is, therefore, most effectually guarded against. In point of fact, indeed, the apparatus would require no watching; since it might be caused to ring a bell when expansion and contraction took place, equally well as when indications were conveyed from the other end.

To the fourth. Great as the momentum of the fluid in a pipe many miles long would be, were it to move with a velocity at all considerable, yet may all inconvenience from it be obviated with reference to the matter in question.

In Montgolfier's hydraulic ram, the velocity of the fluid generating the momentum, is from 15 to 30 feet per second. In the present instance, it need not be above one foot per second. In a pipe of very small calibre, the friction is sufficient to annihilate the momentum requisite to the operation of the ram. It is with a view to this it is stated, that the pipe will be very small in the bore. In order, however, to counteract the momentum it may be found impossible to avoid, recourse must be had to the condensed air in the vessels at the extremities of the pipe.

It is evident, that let the cylinders connected to those air-vessels be of what size they may, they will, if of the same size, counterbalance each other. Now it needs but to increase the size of these cylinders, to neutralize any momentum that would tend to render the indications of the hand, pointer, or indicator, erroneous. It being in no wise necessary to the mere illustration of the principle, the machinery by which the piston rods D (to which the indicators are attached) are moved is not shewn; and it can be conceived, that this machinery may be so constructed, that when the indicator at the end *from* which communication is being made, has arrived at the number to be indicated, it (the machinery) may retain the piston rod D so firmly in the position it then occupies, that the pressure thrown on it by the air cylinder should be unable to move it, even though there were no counterpoise from the water in the pipe, and the air cylinder at the other end. This may be conceived; and being conceived, it will be seen that, in consequence of it, any momentum imparted to the water may be neutralized. The degree to which the air in the air vessels, FF, and air cylinders, EE, must be condensed, may, it is supposed, amount to above 100 atmospheres. Supposing it to be 133 atmospheres, and the area of the air cylinders to be 10 square inches, the amount of the pressure thrown on the water in the pipe would be 20,000lbs. Now if, when a communication is made, the machinery at the end it proceeds *from*, retains the rod D in the position it occupies, when the indicator points out the number to be indicated, the whole of this pressure at the other end will be available to the neutralization of what momentum might tend to carry

the indicator at that end, farther than it ought to move. For, the corresponding pressure from the other end being then withheld, this pressure operates as an opposing power, to any tendency in the water to move farther than it is intended to move; and increasing either the area of the cylinders, EE, or the condensation in the vessels, FF, raising this opposing power to any amount momentum to any extent may thus be counteracted; even were the size of the pipe, and the rate at which the water should be moved, not so arranged as to prevent it.

It may be objected that resistance to the degree supposed would not be opposed, owing to the piston rods D being too weak to bear it. Were it not, that to avoid every thing not essential to the demonstration of the mere *principle*, the machinery by which the motions of the apparatus would be effected is omitted, it would be seen that this defect is guarded against, and that any pressure not exceeding what will absolutely *crush the metal*, (not bend the rod) may be opposed. Owing, however, to its being intended to enter on nothing beyond the mere explication of the principle, this *matter of arrangement* will not be explained.

It can scarcely require pointing out, that the number of changes which may be effected by apparatus on this principle is unlimited.

As shewn here, a million limits the number of signals. But it is only necessary to add an additional division of figures, to increase them to ten millions; two divisions to increase them to a hundred millions; three divisions to run up to a thousand millions, &c. &c.; so that the power of communicating may be termed unlimited.

Neither will it be necessary to shew at large, that correspondence may be carried on in cipher by it; so as for the communications transmitted, to be hierogliphical to all except the correspondent of the party who sends them.

To render this evident, it is necessary to observe only, that as all parties corresponding must possess dictionaries adapted to the purpose, the whole of the words and "sentences of service" in which would be numbered, all that should be requisite to render any communication hieroglyphic or "in cipher" to others than the parties sending and sent to, would be a previous understanding between them, that from, or to, the number indicated, was to be taken, or added, one, or ten, or a hundred, &c.; or that it must be squared, or cubed, or otherwise modified in some way, which, being arbitrary, and known only to the parties themselves, would render their communication secret in the most literal sense of the word. For what could the superintendent of the Telegraph, (or official person at each station,) whose business it would be to send to any merchant at (suppose) Liverpool, a list of the numbers which any London correspondent might direct to be sent to him know of the meaning of those numbers, when it had been previously agreed, that they were to be increased, or diminished, by some quantity known only to the parties themselves; and which quantity, it might farther be agreed, should be increased or diminished by a certain number for every additional communication? Positively nothing. So impenetrably secret, in-

deed, might transmissions of this nature be rendered, that the most important state correspondence might safely be carried on by them.

When it is intended to indicate a number, instead of a letter, a word, or a sentence, the indicator is moved to, and stopped for a moment at, the letter N at the commencement of the scale, prior to pointing out the number; in order to signify that the number itself is to be understood, and not what it refers to in the dictionary.

Such is the illustration of the principle of Telegraphic Communication referred to.

That putting it in practice will be attended with great expense is evident. Whether its certainty will render this objection a minor one, the inventor is not sufficiently aware of the value attached by governments to means of prompt communication, to decide. The saving that will arise from all intermediate stations being done away with, and the maintenance of officers and men at those stations being avoided, may, to be sure, have some effect in this particular.

But in a commercial point of view, it is believed, that means which should bring places (Birmingham, Manchester, Liverpool, for instance) within such communication with the metropolis, and with each other, as to enable a London merchant to transmit an inquiry to, and receive an answer from his correspondents in all those places within an hour*, would prove sufficiently important with reference to the regulation of sales and purchases, as to bring in an ample per centage on the expense of it. The only preventive, indeed, to the establishment of communications of this nature, has been the uncertainty attendant on all systems of Telegraphic Communication hitherto practised; and the necessity of an outlay of 100,000*l.* (500*l.* per mile, *i. e.*) to bring London, Birmingham, Manchester, and Liverpool within a minute's communication of each other, would not, it is conceived, interpose any insuperable impediment.

Be that as it may, however, the value of the principle is but trivially affected. It was sought for; with reference to a purpose, the object of which was to bring these places within two hours' *personal* communication. Should this not be possible, then, indeed, the method of Instantaneous Transmission here described might become all important. But under the conviction that it will be but auxiliary to a method, which will enable us to go from London to Liverpool within a couple of hours, any mean of Telegraphic Transmission, certain though it may be, can prove important in but a minor degree.

IMPROVED CENTRIFUGAL CHECK HOOKS.

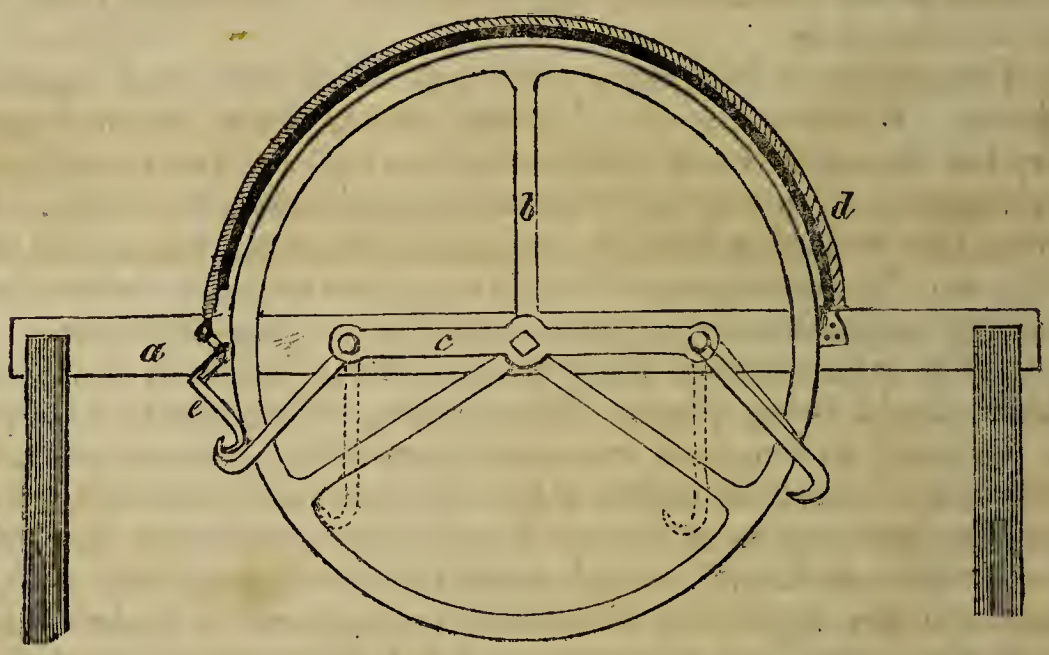
"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"OBSERVING in the latter part of the first volume of your useful Work, an improvement on Mr. Speer's Centrifugal

* The mere message might be conveyed in a minute. But there must be time for the director (or telegraph-officer) at each station, to send the message transmttted to him, to the person it is intended for, and receive his answer.

Check Hooks, and thinking it may not always be desirable for the machine to continue in motion, in case any accident should have occasioned an increased velocity; I suggest another which, in some cases, may answer better. It consists merely in having what (for want of a better name) I call a *binder*, attached to the frame and bending over the fly-wheel (which most cranes and other machines have) in the manner I will now attempt to describe.

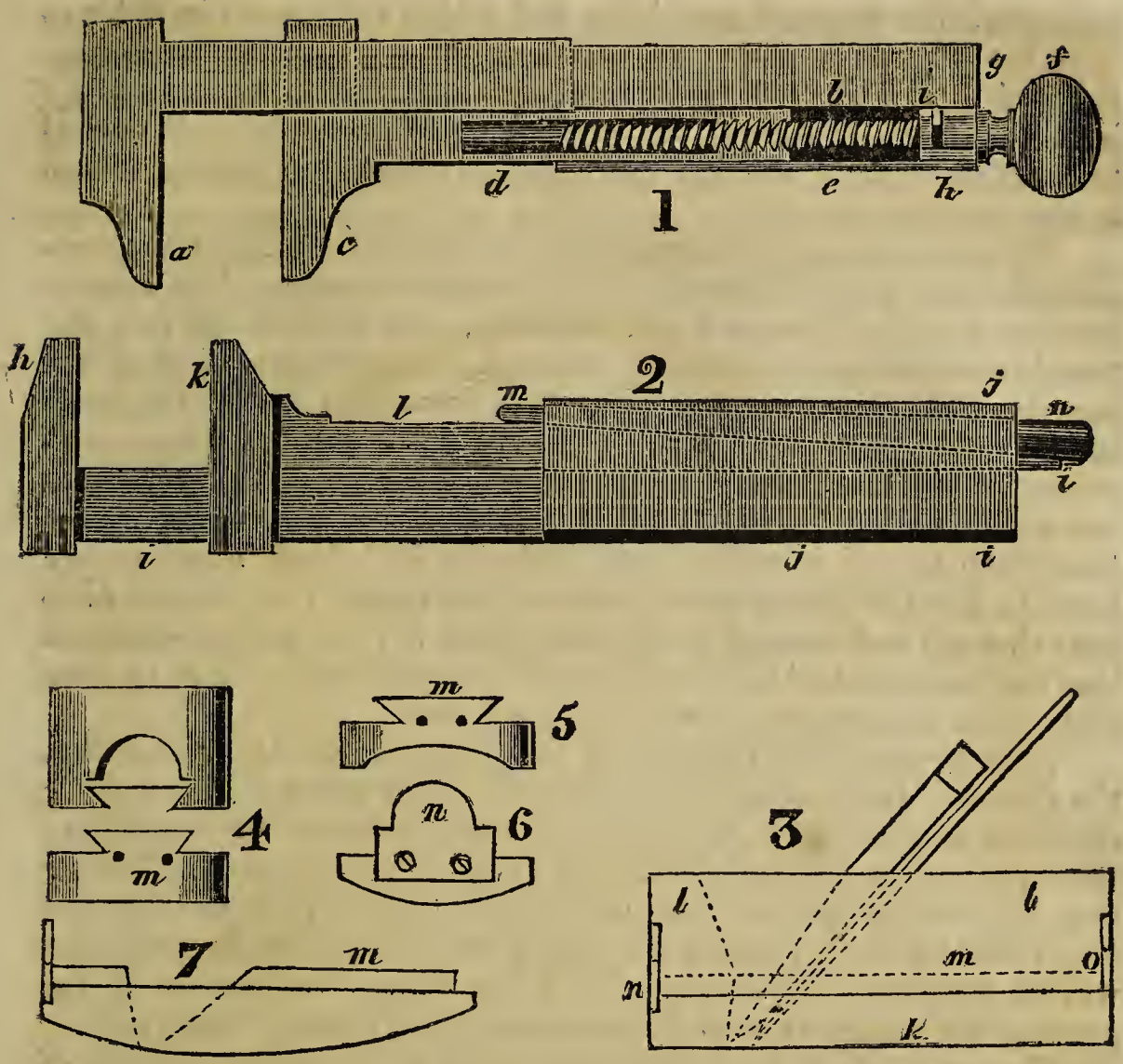


Reference to Engraving.—*a* the main beam which supports the axle of the wheel *b*, *c* a bar on the same axle, and moving with the wheel, to which are attached the hooks. *d* the binder, made of such material as may be thought most proper, (I suggest bent wood strengthened by iron) fastened at one end to the main beam. *e* a sort of crank likewise attached to the beam as represented in the drawing. My object is to stop the machine without the sudden jerk of the check bar, which I think the flexibility of a rope passed over the binder will accomplish. Suppose the wheel moving from left to right the binder not bearing upon it will not impede its progress. If any thing gives way in the works, or any thing happen to the men working it, the weight they were raising descends with increased velocity, reversing the motion of the wheel, and throwing the hooks out of their original position, in which case they catch the end of the crank, (made either with a loop or hook) the other end of which is fastened to the rope passed over the binder which presses it on the wheel and must stop it as soon as the rope is drawn as tight as possible, with, I think, considerably less jerk than the original described in your Work.

"Yours, &c. "H. N."

IMPROVED WORKMEN'S TOOLS.

The preceding engravings are illustrative of some improvements in workmen's tools which received the approbation of the Society of Arts during their last session.



The first figure represents a longitudinal section of an improved Screw-wrench, invented by Mr. Thomas Eddy, of 354, Oxford Street. The screw-wrenches in general use are actuated by a screw which passes up the middle of the handle, which so much weakens them, that they are frequently broken in that part when used in heavy work; and the chaps are liable to open and be loosed from their hold by the handle turning round. These defects are obviated by Mr. Eddy's contrivance, and render the instrument much stronger, effective and compact. The screw is inserted into the sliding part instead of into the handle, enabling the latter in consequence to bear any requisite strain, and removing the tendency of the chaps to open and shut.

a is the fixed chap, *b* the fixed bar, *c* is the moveable chap which passes through and slides upon the bar *b*, *d* the moveable bar fixed to the chap *c*. This bar has a hollow barrel, screwed at its orifice, in which the solid thumb-screw *f* works. At the extremity of the bar *b* is formed a shoulder, on which rests the square piece *g*; or the bar may be turned up at right angles forming a short projecting leg, which will answer the purpose of the piece *g*, and will be both stronger and cheaper. A square hole is to be made at *g* to admit the screw *f*, and this hole is to be contracted in one part by the insertion of two square pins *i* and *h*, which confine the neck of the screw so as to allow it to turn round, but not to move backwards or forwards: *e* is

a plate of iron wrapped round the end of the instrument in order to keep the parts in their proper places, and to prevent the screws from being choked with dirt. Hence it is obvious, that when the screw *f* is turned in one direction, the barrel *d*, with the chap *c*, is pushed towards the chap *a*, and that it is withdrawn when the screw is turned in the opposite direction.

Fig. 2. is another instrument for the same purpose as the *screw*-wrench, and may be termed a *sliding-wedge-wrench*. It is the invention of a Mr. Francis Watt, engineer, who died on the very day that his invention was brought (through the instrumentality of the ingenious Mr. Smart, of Pedlar's Acre, Lambeth,) before the Committee of the Society of Arts. The sum of ten guineas was in consideration of the excellence of the invention presented to Mrs. Watt, the widow of the deceased. *i i* is the fixed bar terminated by the fixed chap *h*, *j j j* is an iron case inclosing and fixed firmly on the bar *i i*; *k* is the sliding chap, having a hole cut in it for the bar *i i* to pass through and secured to the sliding bar *l l*. It will be observed that the lower end of this bar is cut off very obliquely, so as to form a long low wedge. *m n* is another low wedge.

To make use of this instrument, the wedge *m n* is to be withdrawn, the chap *k* is to be moved on the bar *i i*, till the screw-head, or other object to be acted upon, is closely embraced between the two chaps; the lower wedge is then to be driven home. The long line of bearing that the two wedges have on each other renders it impossible that they should give way, and a very slight tap at the point of the wedge will be sufficient to disengage it. A pin should be inserted at the point of the wedge at *m* to prevent its slipping out and being lost.

Figures 3, 4, 5, 6, 7, are descriptive of an economical set of planes invented by Mr. G. Gladwell, carpenter, of Lower Garden Street, Vauxhall, whom the Society of Arts have rewarded for the same. The object is to make one plane answer the purpose of the *pannel*, *jack*, and *smoothing*-planes, also of *hollows* and *rounds*, and various *moulding* planes.

For this purpose the upper part of Mr. Gladwell's plane is constructed in the usual manner, and to adapt the lower or working part to its several uses, a number of shifting soles answering to the varieties above mentioned are provided, which are attached as may be required to the upper part by means of a dovetailed groove; and the workman being in possession of eight soles, flat, concave, or convex, in different degrees and directions, and of five irons, has an equivalent for eight separate planes; whereby a great saving of expense is made, as well as an increased portability acquired. The same letters in each of the figures refer to the same parts.

Fig. 3. is a side view of the plane; *k k* the sole or bottom portion of the plane fitted to the upper part *l l* by a longitudinal dovetail *m m*, shewn by dotted lines; *n* a plate of brass screwed to the bottom piece *k*, to prevent its going too far, and *o* a plate of brass screwed to the upper portion *l l* to stop the end of the dovetail.

Fig. 4. is an end view of the upper and lower pieces separate, to shew the dovetail and groove. *Fig.* 5. is a concave sole. *Fig.* 6. a

convex sole, with the brass plate *n* screwed on. *Fig. 7.* a longitudinally convex sole.

The following are the directions of the inventor relative to the construction of the plane.

Let one third of the height of the plane be the thickness of the sole, having a dovetail fillet (worked in solid, or glued and screwed on) about three eighths of an inch thick and two inches wide. In the upper part of the body of the plane make a fillet for the groove to slide in. The sole slides in from the front of the plane, and secures itself against two brass stops or plates, one screwed on the back part of the plane, the other on the sole in front. The one on the back part answers for all the soles that may be fixed; but each sole must have one in front.

PROPOSED *NEW* POWER.

" ' *Letter to Mr. Russell.*

" ' SIR,

" ' I can well believe that had you been conscious of ' the fact you would not have exposed yourself to the ridicule that ' has been cast upon you in Cambridge. Upwards of ten years ago ' the Rev. Mr. Cecil, whose father was preacher at St. John's Chapel ' in your neighbourhood, exhibited in the public lecture room a Gas ' Engine, which he subsequently brought to considerable perfection. ' Every member of Magdalen College, of which Mr. Cecil was Fellow, ' were, from time to time, five or six years ago, witnesses of his ex- ' periments, and alterations with his engine, which he had in college. ' Upwards of four years ago an account of it was published in the ' Cambridge Philosophical Transactions, with plates exhibiting it in ' detail. It is a pity that you should have gone to the expense of ' publishing a discovery that has been so long and so extensively ' known. ' I am, ' Sir,

' One who often saw and contemplated the purchase

' Of Mr. Cecil's engine, (as a curiosity).

" ' I should recommend you not to discover a machine for grind- ' ing a Parabola, a machine that Mr. Comforth of the same College ' was so long employed on." '

MR. RUSSELL'S NEW POWER ENGINE.

" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" I SHALL feel obliged (and you will be rendering an additional service to the cause of Science) by your publishing the above anonymous letter verbatim, and be pleased not to omit the three lines under the word " New." Were it worth the expense, I would compliment it by a still wider circulation. What was the feeling that may have dictated a letter written, as I humbly conceive, not in the most liberal spirit, whether relationship or a friendly zeal

for Mr. Cecil's fame, (causes one might excuse) or any thing offensive in my note to the Times, or what other the motive may be, it is impossible to decide: the writer will, however, perceive from the publication of it, and may be further assured that I was not aware of Mr. Cecil's engine in any one respect, nor have I the slightest wish to borrow the tiniest feather from his own, or from the wing of Mr. Cecil: no one has less desire to pluck any plumage, much less a stolen one, than myself. If rumour may be credited, this, however, is not an universal feeling. With Mr. Cecil and his invention it is my misfortune not to be acquainted, nor have I the means of becoming so; and have too much sympathy to be in the least disposed to speak or think disrespectfully of either. The correspondent having withheld his name, should, if actuated by a sincere desire to afford information, have at least favoured me with a fuller account: for after all, it does not appear that Mr. Cecil employed the principle of condensation, or if he did so, my mechanism for that purpose: and the merit of Mr. Watt consisted in improving and adapting an old principle. But suppose Mr. Cecil's invention precisely mine, the correspondent surely need not be told that the claim of originality belongs equally to any number, that may, without a previous knowledge of each other's ideas, have formed the same conceptions. Should this be disputed, I refer to the Spectator.

"This gentleman is better versed in Euclid than the Poets and Criticism, if he has not often read the remark, that probably no passage is without a parallel, and yet numberless beauties are not the unconscious reminiscences of former reading. He may also rest assured, and I say it for his satisfaction, that the invention struck my mind cursorily, and has not cost me an hour's anxiety, nor a single head-ache, and as to the trifling expense he alludes to, it is dust in comparison with the object, and as it may have the very probable effect of not merely amusing the Students of Cambridge, but of awakening the attention of the world. Every candid reader will, therefore, think with myself, that Mr. Cecil has no cause of anger against me, and I am sure of having no wish to detract from Mr. Cecil: the world, however, may be obliged to both. With respect to the ridicule, neither this gentleman, or the College, dare impute piracy. What then becomes of the silly ridicule? Is there any proof of impracticability? rather the reverse. All men act more or less from mixed motives. Under all these circumstances, then, what is there ridiculous in publishing conceptions beneficial to others? As well might the inventor of gunpowder be ridiculous, because Roger Bacon is supposed to have had a similar notion. Such ridicule, if it exist, is the offspring of a little corporate pride, the index of a puny-mindedness, which feels more pleasure in damping, if possible, individual effort than a generous satisfaction in the extension of Science. Such ridicule is not only ridiculous, but to be held in utter contempt. I shall not yet quit this subject.

"The writer, if not a clergyman, has had the advantage of living in their society; and before he sat down to pen the letter, would have done well to recollect something in the New Testament about

putting a candle under a bushel. I leave him to reconcile his letter with either the Gospel, or Cicero de Officiis, a book with which he is no doubt well acquainted. I have ever thought that elevation of sentiment was one of the greatest results of a classical education.—If emoluments be the sting, the gentleman need not be alarmed. I am indifferent who executes the proposition, but should feel pleasure in seeing it reduced to practi e, and would gladly render any assistance in my power to the most friendless mechanic. I am not one of those who affect to contemn public scientific bodies: with particular evils, they may easily be shewn to be a source of great, direct, and indirect good. Ardent an admirer however as I am, and quite as much so as my informant, of learned societies, I shall take leave in conclusion to remind him, that knowledge is no longer closeted in colleges, any more than in inns of court. The angel (thanks to a former resident in Gray's Inn, Lord Bacon,) has long since gone forth.

"I am, Sir,

"*Gray's Inn,* "Your obedient Servant,

"*April 7th,* 1825. "F. RUSSELL.

"P. S.—A friend, who is standing by, regrets, with me, that so much paper should have been wasted, without stating one main point at issue, whether Mr. Cecil's was a condensing engine. Again, even had I stolen Mr. Cecil's ideas, a publication in the Times, and your Work, were most serviceably calculated to summon attention, while the Cambridge Transactions (I say it as a fact, not from a disrespectful feeling) might be slumbering on the shelves of amateurs, or undergo a destiny more degrading, the common death of most books, without other fruit than the amusement of a few contributors, still fewer readers, and the support of some two or three printers and an engraver."

DR. CHURCH'S NEW BORING INSTRUMENT.

It is said that Dr. Church, of Birmingham, has invented a new boring instrument for wood, which possesses much greater powers than any hitherto made. When turned by the right hand, like a gimblet, it will penetrate through a 4-inch dry deal in fifty seconds. With the assistance of a spring bow it may be made to pass through a 7-inch post in twenty-one seconds.

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

LAPIDARIES' WORK.—The wheel made use of by the Hindoos for the cutting and polishing of precious stones, is composed of one part gum lac, and two parts of powdered emery (or corundum). The emery powder is first heated in a earthen vessel, and when the heat is sufficient to melt the gum, it is added in small portions, stirring the whole about to promote the union. The paste thus made is beaten with a pestle on a smooth slab of stone; afterwards rolled on a stick and re-heated several times. The mixture being uniform, it is taken from the stick, and laid on a stone table previously covered

with the fine emery powder, where it is flattened into the shape of a wheel by an iron rolling pin. The wheel is then polished by an iron plate and emery powder, and a hole made through the middle for an axis by a hot rod of iron. When mounted it is fixed with its axis in an horizontal direction, and the workman causes it to revolve by means of a spring bow held in his right hand, while he holds the stone to be cut in his left, occasionally applying emery and water. The polishing he effects by leaden wheels and a finer powder.

Comets.—M. de Biela has observed that the luminous state of the sun is peculiarly affected by the proximity of comets, which in approaching to their perihelion cause an increased number of spots upon its surface.

Amputation.—It is said that an instrument has been invented by a Dr. Buller of Hamburg, by meams of which he can take off a man's leg in a Second; and by a simultaneous pressure, it so benumbs the part as to relieve the patient of pain.

The Indian Chica employed in Dyeing.—The red colouring matter with which the Indians of the Orinoco paint their bodies is obtained by boiling the leaves of the Bignonia Chica for a long time in water, and afterwards precipitating the fecula by the addition of some pieces of the bark of a tree common in the Savannahs of Meta, and called *arayana*. The red precipitate is then washed and formed into round cakes about 2 inches thick and five or six inches in diameter, and afterwards dried. In this state it is met with in commerce, and is now being introduced for the purposes of dyeing. It is found to communicate to cotton a fine yellow orange colour.

Clock-work.—The cognoscenti in elegant mechanism have long been in the habit of admiring a beautiful time-piece, which bears Sir William Congreve's name (but whether with or without his sanction we know not,) in which the minutes are indicated by the descent of a brass ball, along a number of inclined planes from right to left, and left to right, on the face of an inclined brass plate. When the ball reaches the bottom of the plate, after having described the last of the inclined planes, it releases a detent which tilts the brass plate, and inclines it in the opposite direction. The ball being now at the top of the system of inclined planes, commences its retrograde motion, and when it again reaches the bottom, the plate is again tilted at the opposite position.

This clock was invented by M. Serviere, and is minutely described in various forms in a French work which we have now before us, entitled Recueil d'Ouvrages Curieux, &c. Lyons, 1719. In all these clocks, however, the ball is carried up by machinery from the bottom to the top of the inclined plane, whereas in Sir William Congreve's, the plane is moveable, as above described, which is a very important improvement.—*Brewster's Journal.*

Farming.—Rearing of Calves by Fiorin Tea.—Upon the estate of Sir James Stewart Denham, at Coltness, a number of calves taken from their mothers at two or three days old have been successfully reared by feeding them upon Fiorin tea, made in the following

manner: two pounds of Fiorin hay were put into ten Scotch pints of water, and boiled down to half; to this was added one Scotch pint of skimmed milk. Subsequently five more were raised upon the same preparation with the addition of a small quantity of treacle, and it was proved before Sir James and Lady Stewart, and Miss G. Dalrymple, that the calves decidedly preferred the Fiorin Tea so made, to sweet milk.—*Trans. Highland Society.*

Great Rain at Manchester in 1824.—According to the most accurate observations by M. Dalton, the following extraordinary quantities of rain, fell, during the last four months of the year.

September, ..	5,440	November, ..	5,510
October, ...	6,896	December, ..	7.835

Making a total of rather more than 25½ inches for the *four* months;—notwithstanding the mean *annual* quantity of rain at Manchester is only about 34 inches.

Horticulture.—D. Powel, Esq. of Loughton, Essex, recommends the following method of securing the scion when fitted to the stock in grafting, spread the grafting wax in a melted state *evenly* on sheets of moderately thin brown paper, and when cold cut it into slips about ¾ of an inch wide; warm one of these slips with the breath, and bind it round the stock and scion, pressing it gently with the hand, when it will be found to adhere so closely as totally to exclude both air and moisture. The wax may be prepared by melting together 1lb. of pitch, 1lb. of resin, ½lb. of bees-wax, ¼lb. of hogs-lard and ¼lb. of turpentine. By placing the composition in an earthen pan over boiling water, it may be kept in such a state of fluidity as to be easily spread on the paper with a brush.—*Trans. Lond. Hort. Society.*

Diorama.—The proprietors of this ingenious mechanical theatre are preparing another piece for exhibition, which is spoken of in unqualified terms of admiration. The scene is a view of the city of Rouen, over which a violent storm takes place; when it abates, a beautiful rainbow appears: this evanescent object vanishes imperceptibly, and the storm again comes on with redoubled fury, exciting in the beholder the utmost astonishment at the illusions of art.

Moveable Keels.—The introduction of moveable keels for navigating in shoal water is now a new idea. Dr. Franklin speaks in terms of commendation of a moveable keel which an acquaintance of his had invented, for the purpose of navigating his boat with greater facility in shallow water. The keels of boats it is well known, very frequently prevent them from running quick on shore; this inconvenience the Doctor's friend remedied by forming his keel of two longitudinal pieces of timber, which rested upon hinges. To the bottom of each piece of timber two chains were affixed, the ends of which being retained within the boat, the keel, or rather the two half keels, could immediately be drawn up close to the sides of the boat, and lowered again at pleasure. By this contrivance the vessel possessed all the advantages of a keel in deep water, and those of a flat bottom in shoal-water.

RECENT PATENTS.

GAS TUBES.—To Cornelius Whitehouse, of Wednesbury, Staffordshire, for improvements in the manufacture of tubes for gas, and other purposes.—Sealed February 26th, 1825.

PLATING IRON WITH COPPER.—To David Gordon, Esq. of Basinghall Street, and William Bowser, of Parson's Street, Wellclose Square, for improvements in coating or plating iron with copper, or such metallic compound wherein copper is the principal ingredient.—Sealed 28th February, 1825.

CORKING BOTTLES.—To John Masterman, of 68, Old Broad Street, for an improved method of corking bottles.—Sealed March 5th, 1825.

FILTERING APPARATUS.—To A. H. Chambers, E. Chambers, of Stratford Place, and Charles Jerrard, of Adam Street, Esquires, for a new filtering apparatus.—Sealed March 5th, 1825.

FORGES AND BELLOWS.—To William Halley, of Holland Street, Blackfriars-road, for improvements in forges, the bellows and other apparatus used therewith or separate.—Sealed March 5th, 1825.

ROTARY PUMPS.—To Robert Winch, of Battersea Fields, for improvements therein. Sealed March 5, 1825.

FULLING CLOTH.—To William Hirst and John Wood of Leeds, for certain improvements in cleaning, milling, or fulling cloth. Sealed March 5, 1825.

RAIL-WAYS.—To W. H. James, of Birmingham and London, engineer, for certain improvements on rail-ways. Sealed March 6, 1825.—[*This invention is fully described in No.* 41 *of the Register of Arts.*]

WINDOWS.—To J. L. Bond, of Newman Street, architect, and James Turner, of Well-Street, builder, for an improved construction and manner of hanging French or folding sashes, adapting them more effectually to exclude air and moisture. Sealed March 9, 1825.

SUBSTITUTE FOR LEATHER.—To Thomas Hancock, of Old Street, for a new manufacture to be used as a substitute for leather. Sealed March 15, 1825.

WATER-PROOF COATING.—To Thomas Hancock, of Old Street, for a preparation or new method of rendering ships' bottoms, vessels and utensils, &c. impervious to air and water. Sealed March 15, 1825.

CORDAGE.—To Thomas Hancock, of Old Street, for improvements in the process of manufacturing rope, cordage, and other articles from hemp, flax, and other fibrous substances.—Sealed March 15, 1825.

DOORS AND GATES.—To John Collinge, of Lambeth, engineer, for improvements on springs and other apparatus used for closing doors and gates.—Sealed March 15, 1825.

LACE.—To H. Nunn, and G. Freeman, of Blackfriars-road, for improvements in machinery for making bobbin-net lace.—Sealed March 15, 1825.

NAVIGATION.—To Captain Samuel Brown, R. N. for an apparatus for propelling vessels employed in inland navigation.—Sealed March 15, 1825.

REFINING SUGAR.—To Joseph Barlow, of the New Road, St. George's in the East, for a process for bleaching and clarifying sugars.—Sealed March 15, 1825.

AIR-ENGINES.—To William Grisenthwaite, Esq. of King's Place, Nottinghamshire, for an improvement in air-engines.—Sealed March 15, 1825.

NAVIGATION.—To Mark Cosnahan, Esq. of the Isle of Man, for a new apparatus for ascertaining the way and lee-way of ships and other vessels.—Sealed March 17, 1825.

TO READERS AND CORRESPONDENTS.

EDWARD JENNSON's Communication is received; but as he has omitted to state the object or intention of his proposed invention, the publication of it is necessarily deferred.

H. W. is informed that an account of Parker's Burning-glass has already appeared in the Register.—see Vol. I. pp. 93-4.

We hope our friend L. B. W. will not forget his promised Communication respecting a certain remarkable liquid.

H. S.—W. B.—PHILOMETER.—A MECHANIC.—M. H.—T. H. C.—and W. M. are received.

MR. SMITHSON's Communication received as this Number was going to press will be inserted in our next.

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REGISTER

OF

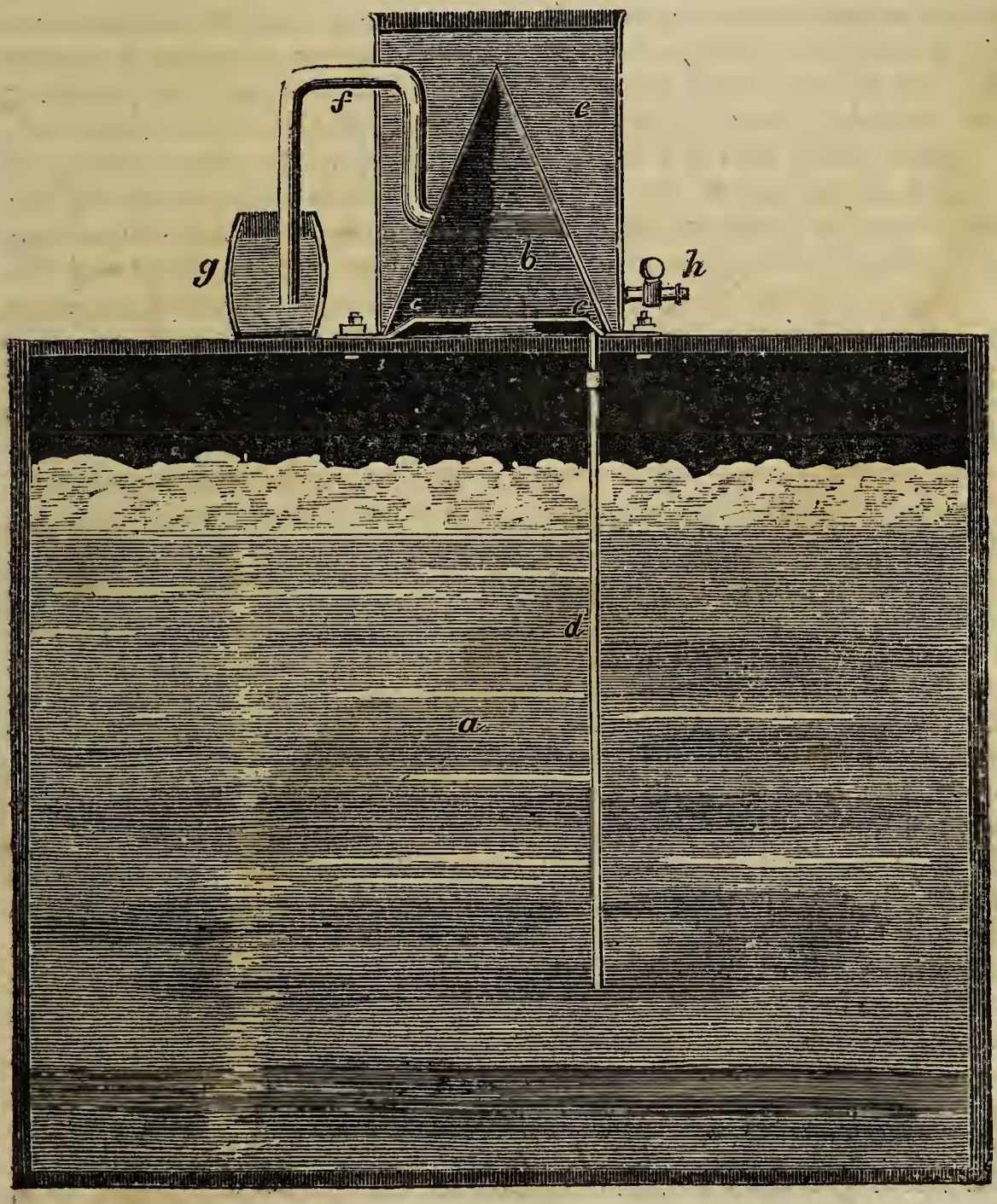
THE ARTS AND SCIENCES.

No. 43.] SATURDAY, MAY 7, 1825. [Price 3*d*

CONTENTS:

Patent Fermenting Apparatus.. 290
Brown's Gas Vacuum Engine .. 294
Oxy-Hydrogen Blow-Pipe improved ..... *ib.*
Gladwell's Plane..... 296
Machinery for propelling Carriages on Land, and Vessels on Water 297
Day's Patent Brass-cased Knobs 298
Mills and Fairman's Patent Waterproof Composition 299
Dalas's Patent Mason's Appaaltus 301
Higgin's Patent for consuming Smoke ..... *ib.*
Bleaching of Ivory..... 302
Queries in the Graphic Arts.... *ib.*

Miscellaneous—Late Inundation at Petersburg, 302;—Colouring and Pointing Brick Houses, 303;—Process in preparing the extract of Mimosa in New South Wales, *ib.*—New Portable Pump, *ib.*—Geography of Plants, 304;—Patents, Correspondents, &c.



DEURBROUCQ AND NICHOLS' PATENT FERMENTING APPARATUS.

DEURBROUCQ AND NICHOLS' PATENT FERMENTING APPARATUS.

The vinous or alcoholic fermentation being necessary to the production of one of the chief articles of our subsistence, namely, beer or wine; it necessarily follows that the most economical and complete method of conducting that process, is a study of real importance to the public at large; more especially as not only the *good or bad quality*, but also the *quantity* of those products depend upon the manner in which the operation is performed. By unskilful management in this interesting department of brewing it is well known that the spirit is dissipated, and the valuable materials are converted into a vapid, sour, and unwholesome liquor, instead of a nutritious and refreshing beverage; and such a result will almost invariably be the case, if the person attempting to brew has not a chemical knowledge of the natural changes produced in saccharine matters by fermentation, or experience to guide him in the place of scientific information. Such being our opinion, we are anxious to press upon the attention of those of our readers whom the subject concerns, a little pamphlet published by Messrs. Westley and Parrish, of 159, Strand, entitled, "*Observations on the Vinous Fermentation, with a description of a Patent Apparatus to improve the same. Also a Statement of the advantages to be derived from this System when applied to the process of Brewing, as confirmed by the testimony of Messrs. Gray and Co. Brewers, of West Ham, in the county of Essex.*" In our description of the invention we shall avail ourselves of the judicious observations contained in this valuable treatise, and accordingly make the following extracts:—

"The common practice, until a few years back, has been to ferment in open vessels; and though it was a circumstance well known among chemists, that a certain portion of spirit and flavour escaped in the form of vapour during the process, yet no one had an idea that the condensatory system could be applied; as it appeared impossible to effect the fermentation in air-tight vessels, being unable to surmount the great difficulty which existed, of keeping down and managing that enormous bulk of non-condensable gases, which are emitted during the decomposition of the saccharine matter, and which acquire greater expansive force by the gradual increase of heat.

"The idea, however, occurred to Madame Gervais, a proprietor of considerable vineyards near Montpellier, who has founded a system on the following principle: that what is termed the vinous fermentation, is a mild, calm, and natural distillation; which, according to the usual acceptation of the word, has proved a correct system, since not a single drop of spirit is formed before it commences, nor after it is over. Having first laid down this ground-work, she proceeded to obtain an apparatus that would operate in such manner as to return into the vessel the spirit and flavour that was evolved from the fermenting gyle, and let out the non-condensable gases, which might, by the increasing heat, acquire too great an expansive force, and burst the working-tun; a short description of this apparatus will be a fresh

proof that the greatest advantages are often derived from the most simple means.

" It consists of a vessel resembling the head of the antient still, and constructed of such form as to be capable of being placed securely on the back or vat, in which the process of fermentation is to be carried on; the back or vat must be closed air-tight, with a hole in the top, communicating with that part of the apparatus called the cone or condensor. This cone is surrounded by a cylinder or reservoir, which is to be filled with cold water, so that the alcoholic vapour or steam, evolved during the process, may be condensed as it comes in contact with the cold interior surface of the cone; and being thereby converted into liquid, trickles down the inside of the condensor, and through a long pipe is returned into the fermenting liquor.

" *Reference to Engraving.*—*a*, a closed vat in which the process of fermentation is carried on. *b*, condensing cone, communicating immediately with the interior of the fermenting vat. *c c*, a small channel extending round the interior base of the cone being adapted to receive the condensed alcohol and essential oils, from whence they are conducted down the small pipe *d* into the vat. *e*, reservoir for containing cold water surrounding the cone. *f*, exit pipe communicating with the interior of the cone, its extremity being immersed some inches below the surface of the water in the small tub, *g*, from whence the non-condensable gases are permitted to escape into the atmosphere. *h*, a cock to draw off the water from the reservoir, *e*.

" By the application of this apparatus, a considerable portion of alcohol, which has been hitherto suffered to escape in the form of vapour, along with the non-condensable gases, is condensed and returned into the liquor; and the non-condensable gases are carried off by a pipe, which, proceeding from the interior lower part of the cone, and running up the inside of the cylinder in the cold water, passes out through the side, and the end is immersed some depth below the surface of water contained in a separate vessel, permitting the gases to escape, but still under a certain degree of pressure, the object of which is, to confine the alcoholic steam and gas within the cone, and allow them a sufficient time to cool and condense.

" To persons in the least acquainted with chemical operations, it would be useless to dwell on the merits of this apparatus; they will at once see how beneficial it would prove to any liquid that has to undergo the vinous fermentation in any stage of its manufacture; but to those who are not so conversant in the principles and causes of these operations, we shall proceed to point them out.

" To obtain a good fermentation, as complete a decomposition of the must or wort, and as perfect a recomposition of alcohol as possible, are the great objects to be obtained. To acquire the former, three requisites are necessary; fluidity, heat, and motion. The latter; density, coolness, and tranquillity."

The writer then proceeds to examine each of these requisites separately, and to shew that the necessary degrees of *fluidity* and *heat* are best preserved by the even temperature afforded by the patent

apparatus, by which the fermentation will proceed through its different stages, as well during the hottest days of summer, as in the selected months of autumn and spring. With respect to *motion*, it having been proved by that eminent French chemist, Mons. Gay Lussac, that the admission of a small portion of atmospheric air is only necessary to allow the fermentation to commence, (the oxygen of which is soon absorbed by the carbon to form carbonic acid gas) and that there is no occasion in the subsequent stages for any further supply, our author observes,—

"This discovery is of the greatest importance, since it enables us, without the least detriment or inconvenience to the process, to exclude the oxygen of the atmospheric air, which, by constantly supplying the gyle with the principle that causes and promotes acidity, casts on it from the first that roughness and disagreeable flavour which spoil most of our common beverages.

"Here again the new apparatus proves of infinite benefit; for as soon as carbonic acid gas is evolved from the fermenting gyle, the atmospheric air being lighter, is driven out from the upper part of the working-tun; and as no air is permitted to enter afterwards, all the subsequent carbonic acid gas emitted diminishes the quantity of oxygen contained in the gyle, by the oxygen uniting with the carbon as fast as it disunites from the saccharine matter during its decomposition, and thereby secures a soundness and peculiar mildness not to be procured by any other mode."

"The apparatus being applied to ferment the must of grapes, has been found to procure an increase of quantity, amounting in some instances to ten or twelve per cent., and which necessarily varies according to situation, season, or former management; but in no instance has it been found less than from five to six per cent.

"When applied to the fermentation of beer, this saving has constantly been between four and a half and five per cent., a quantity certainly inferior to that obtained from wine, but which will not appear unimportant when we consider this saving is a spirit congenial to the nature of the beer, and an essential oil necessary to its preservation."

"The great advantages to be derived from this system are, excluding the atmospheric air, by which the acid principle, which beer absorbs from the air during fermentation, is prevented entering into combination with it, and thereby insuring the brewer the certainty of making as sound beer during the hot weather as in winter: also the essential oil of the hops and the spirit, which escapes on the old principle, are condensed and returned immediately into the beer, thereby preserving an uniform flavour at all times.

"In addition to the preservation of flavour, strength, and soundness, and enabling the brewer to insure his beer, an increase of five per cent. is gained in the quantity, not only by condensing the alcoholic vapour, but by the yeast settling in a solid body at the bottom of the tun, so that the beer may be drawn off clear to the last, and the yeast will be left in good condition for PITCHING with; likewise the waste occasioned by the old system of cleansing will be prevented,

and the beer will retain the fixed air in it according to the resistance placed at the end of the escape-pipe, and a considerable saving of labour attend it.

"Upon the new system, the fermentation may be brought to a perfect state at any period, according to the degree of heat made use of for fermentation; for as long as there remain any particles of saccharine matter in solution undecomposed, so long will the beer continue to increase in strength, arising from the decomposition of these particles, and which can only be promoted by their dilatation with a high fermentation heat; but when the whole of the saccharine matter is decomposed, and as perfect a fermentation as possible obtained, attenuation will be complete, and the beer will precipitate perfectly bright, there being no longer any carbonic acid gas generated to stir up the grosser particles of the fermented matter.

"Upon the old system of fermentation, beer can seldom be kept until it has attained a perfect state of attenuation; for as the decomposed particles of saccharine matter yield the basis of spirit, so also they yield the basis of acidity; and the beer having already absorbed too large a portion of that principle, an increase of attenuation is generally accompanied with a great increase of acidity.

"The flavour of beer, on the old system, depends upon the fermentation-heat, as the greater the heat in the tun, the larger is the quantity of essential oil evaporated, with a consequent loss of flavour; therefore, to insure a good flavour, a low fermentation is necessary, and the lower the fermentation, the longer the saccharine matter is before it decomposes; whereas, on the new system, the whole flavour and strength are preserved, and any degree of heat may be employed to accelerate the fermentation, and bring the beer to an early attenuation."

The utility and importance of Madame Gervais' discovery have been justly appreciated by the purchase of her patent right by a company of gentlemen, consisting of several of the ablest chemists and most enlightened men of France, among the names of whom it is only necessary to mention those of Count and Viscount Chaptal, whose philosophical elucidations furnished, in a great measure, the Committee of the English House of Commons with the necessary information on vegetating barley during the process of malting about sixteen years ago.

Messrs. Gray and Dacre, of West Ham, were the first to adopt the improved system in this country; Messrs. Whitbread and Co. of Chiswell Street, have followed their laudable example; and Messrs. Bishops and Co., of Finsbury Place, are now, we are informed, very advantageously employing it in the manufacture of wine. It is, perhaps, necessary to add, for the information of persons desirous of inspecting the Apparatus, that it is manufactured by Messrs. Shears and Sons, of Fleet Market; and that the Agents for the patentees are the before-mentioned gentlemen, Messrs. Gray and Dacre.

BROWN'S GAS VACUUM ENGINE.

In a recent Number of the Register we copied from the British Traveller an account of the difficulties which Mr. Brown was said to have had to contend with in bringing his valuable invention into practical application; and we expressed our gratification in learning that the most sanguine hopes were entertained of his ultimate success.

To enable us to answer the queries of a correspondent (Aquarius) as well as for own satisfaction, we have very recently availed ourselves of the Patentee's permission to view the piston engine which he has set to work, on the premises in College Hill, and the manner of its operation *almost* justifies in announcing that the anticipated success of the invention is already* obtained.

The engine which we saw at work is about the power of one horse, the piston being six inches in diameter. It makes about thirty-five double strokes per minute, and works with great regularity. The ignition of the gas in the vacuum cylinders is instantaneous, and the vacuum is effected with great rapidity and precision. The apparatus being mostly bright, and of superior workmanship, it forms a most beautiful machine; and the apparent complexity which strikes the eye at first sight vanishes on a nearer approach and examination of the simplicity and order of its several movements.

The mercury guage not being applied to the engine at the time, we were permitted to make trial of its power by loading the beam with our weight, the result of which fully satisfied us that the available force is not less than seven pounds on the square inch, notwithstanding a considerable portion of power is by this mode unavoidably lost, by the expansion of the air. Some great improvements are, however, in progress, by which it is confidently anticipated that the use of the full power of the vacuum effected will be obtained, deducting of course for the friction of the machinery, which it is calculated will then leave for practical application a power of ten pounds per square inch. Should Mr. Brown accomplish this, he will indeed exceed the most sanguine expectations, and confer the most important advantages to society.

IMPROVED SAFETY CHAMBER TO THE OXY-HYDROGEN BLOW-PIPE.

In our 9th Number, Vol. I. we gave an account of Mr. Gurney's Oxy-hydrogen Blow-pipe. This valuable instrument had for one of

* We say, *already*, for it should be borne in mind that the steam engine took 150 years to bring to its present state of excellence, with the united talent of the greater part of our most scientific engineers devoted to its improvement during that period of time. It is, therefore, somewhat illiberal in our correspondent, to expect that the inventor of the Gas-Engine should not be occupied at least as many days (as the Steam Engine took years) in attaining the full accomplishment of his reasonable views, which are to bring into operation an available power of not less than ten pounds upon the square inch. From the extraordinary specimens of ingenuity at present exhibited, as well as from the reasonableness of the expectation, we have no doubt that a power equal to this will, ere long, be obtained.

its earliest adopters Mr. Henry Wilkinson, of Ludgate Hill, from whose ingenuity it has derived a very important improvement; by which a much larger jet may be employed than heretofore with perfect safety to the operator. The following communication on the subject was made by the inventor to the Society of Arts, who awarded to him their large Silver Medal for the same.

"In consequence of an explosion which took place last November, while volatilizing platinum with Mr. Gurney's oxy-hydrogen blow-pipe, I was induced to try some experiments, in order to render that instrument, if possible, more secure. *(It is justice here to observe that at the time of the explosion I was using a much larger and longer jet than any of those sold with the blow-pipe, and differently situated.* If the society should consider the result I have obtained worth notice, I shall be happy to prove the correctness of it by experiment and testimony.

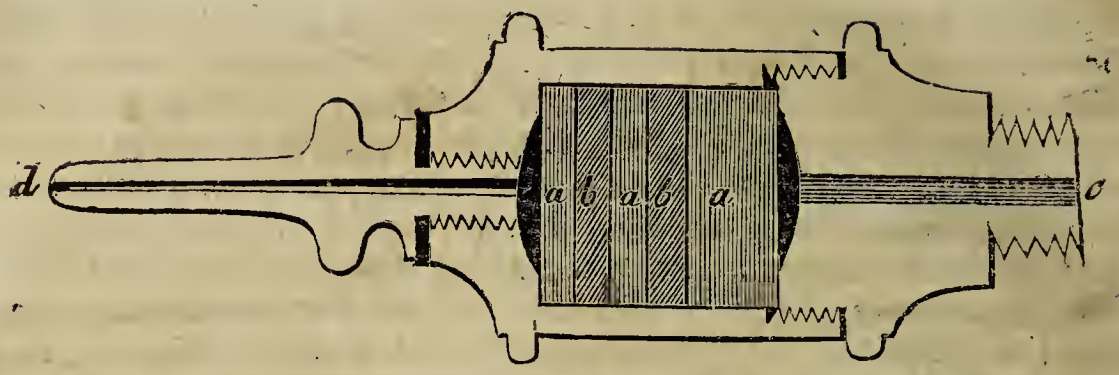
The construction of Mr. Gurney's safety tube is known to the Society; the chamber in which not being able, under certain circumstances, to arrest the retrograde motion of the flame, I thought it probable that the interposition of any bad conductor of caloric might effectually prevent its return; how far I have succeeded may be judged by the following experiments made with the same jet, all other circumstances of position and dimensions being correctly alike.

Having first chosen such a jet and arrangements of parts as would always explode with Mr. Gurney's safety-tube on diminishing the pressure, and would *frequently* so at the moment of ignition, I removed that and substituted another safety-tube entirely filled with wire-gauze; I still, however, found the flame return, driving out the cork every time, as in the preceding experiment.

"I then tried a third tube, into which I had introduced between the layers of wire-gauze, and in the centre, some asbestus previously beaten with a mallet and pulled out, so as to resemble floss silk. With this I never could succeed in causing an explosion to take place, although the flame of a wax taper was kept close to the orifice, and the pressure was diminished as gradually as possible; nor did it explode even when the orifice of the jet was enlarged. These experiments have been repeated by myself, and by a friend, a great number of times with the same result. I am not aware that asbestus has even been proposed or employed before for this purpose. The advantage of using this substance is evident, as the fibres cross each other in every possible direction, thus forming a filter for the gases to pass through much finer than any wire-gauze, and by its bad conducting quality it prevents those layers of wire-gauze which are behind it from being heated when an explosion takes place in the cavity of the jet.

"The cylinder is of brass, about three quarters of an inch long, and the same diameter internally, (the figure represents it of the real size) and is filled in the following order, beginning at the end into which the jet screws.

"The wire-gauze being cut to fit the cylinder correctly, each disc is introduced separately, having a small quantity of glazier's



putty round the edge, and is pressed in with a piece of wood turned to fit the cylinder. After the first ten layers of wire-gauze, *a*, have been introduced, a layer of asbestus, *b*, is inserted one-eighth of an inch thick, equally laid out and not pressed in too hard, then come ten more layers of wire-gauze, *a*, another layer of asbestus, *b*, and lastly twenty discs of wire-gauze, *a*, the two ends of the cylinders being concave, in order to afford as large an area as possible for the passage of the gas from the entrance pipe, *c*, to the jet, *d*. As the object of this arrangement is to keep the last series of wire gauze cool by the interposition of bad conductors of caloric, it appears probable that the safety would be rendered theoretically more perfect if the cylinder itself were a bad conductor, such as earthenware having brass caps cemented on the ends; or platinum, if metal were made use of, on account of its low conducting power. A brass cylinder, however, appears to be perfectly safe for every purpose, as I have never been able to cause an explosion to take place, although I have allowed the flame to retrograde, by gradually diminishing the pressure from 60 to 100 times successively, while using very long jets of one-eighth of an inch diameter at the aperture and much larger within. The wire-gauze should not be finer than from 3600 to 4900 apertures to the square inch, as it is liable to be fused by the return of the flame. I found that when I used wire-gauze with 8100 apertures it was destroyed in a very short time."

GLADWELL'S PLANES.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I am led to notice Mr. Gladwell's improvement in planes, as it appears to me not to be adapted to practice. Sometimes when a plane is worn, it is a custom to fix a sole to it, but planes thus shoed are liable to what is called "*chattering*," that is, a kind of whirring noise occasioned by the jarring of the two parts, and this effectually prevents a smooth surface from being obtained on the substance planed.

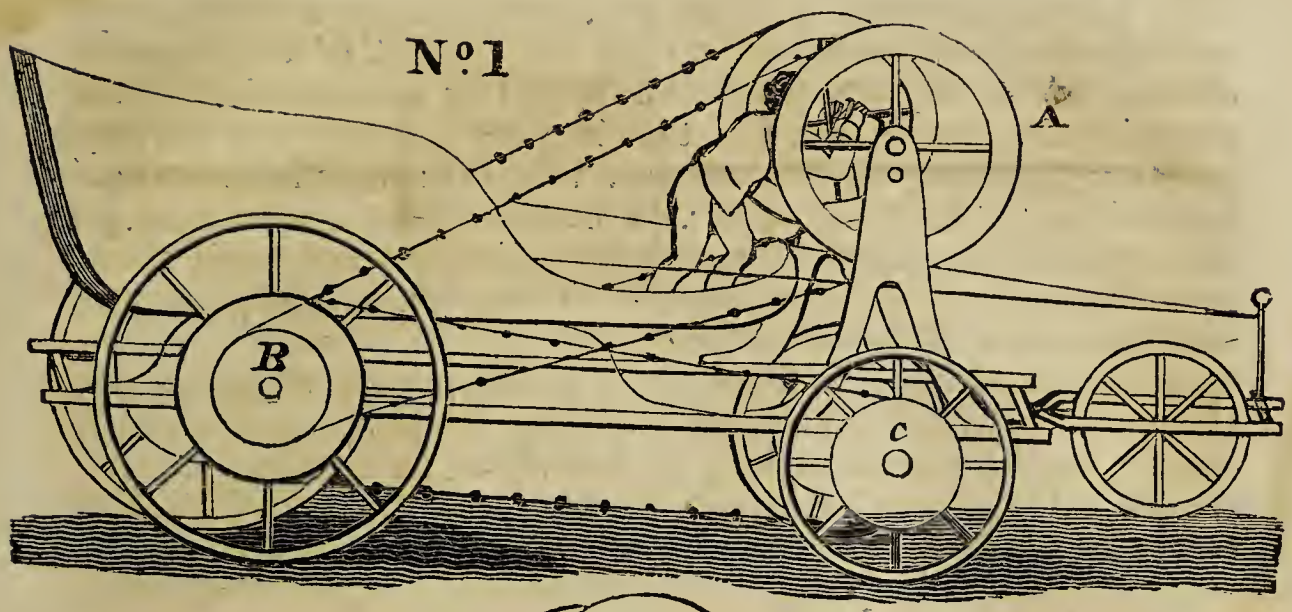
"Now I cannot conceive that Mr. G. can, by any temporary fastening, so secure the sole to the plane as to be free from this defect.

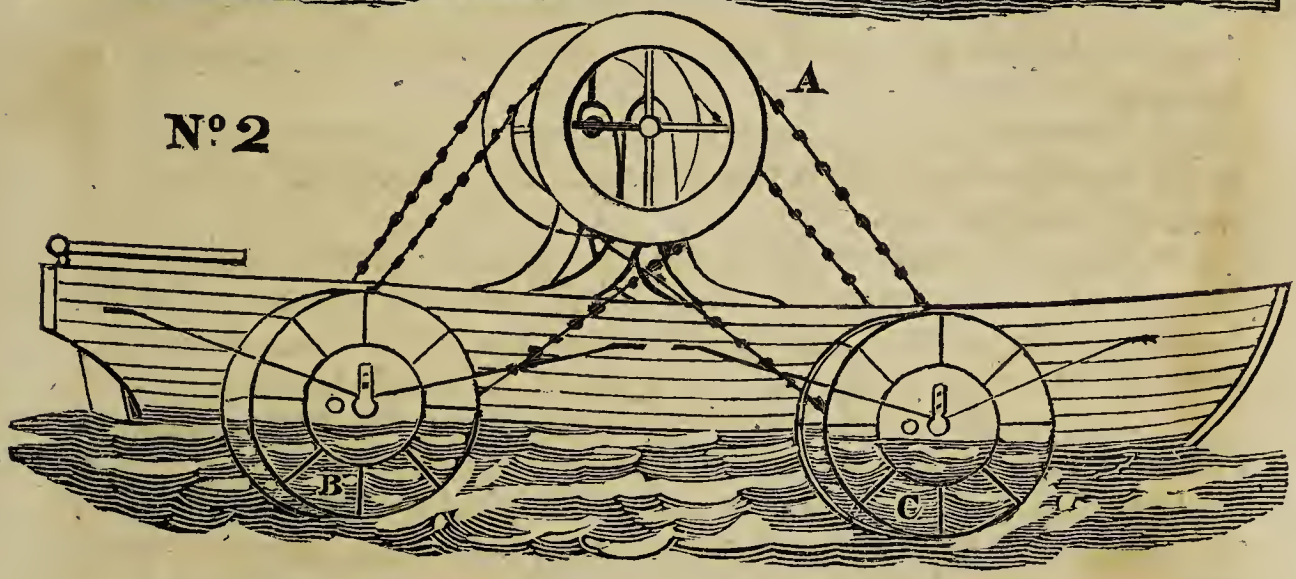
"I remain, Sir,

"Your's, respectfully,

"A SHIPWRIGHT."

"*Rotherhithe Street, April 30th*, 1825.





SIMPLE MEANS OF PROPELLING CARRIAGES ON LAND, AND VESSELS ON WATER,

BY MANUAL LABOUR.

" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" No. 1. REPRESENTS a Carriage, propelled by the manual turning of a pair of wheels, which may be adapted to various degrees of velocity.

" The wheels A are turned by means of a handle, shaped like that of a grindstone, which extends from one to the other; these wheels are grooved to admit the rope which connects them with the hinder wheels of the carriage, and have a sort of rack to prevent it slipping; the carriage wheels B and C, where the rope is applied, are formed in the same manner.

" I am uncertain whether the application of the principle of motion, exemplified in the above drawing, to a loco-motive carriage, be new or not, the principle itself is certainly not, as it is no more than what is daily seen in the machines of itinerant grinders: in fact, it is as old or older than the invention of rotary motion.

" It appears to me, however, that it might be usefully applied, in the manner I have endeavoured to explain, for many purposes.

"It would combine, I think, the desirable advantages of safety and œconomy, and would add to the employment of the labouring classes, which is undoubtedly an important consideration at the present time. I am persuaded that it might be adapted to the purposes of travelling in this country, where the roads in general are so excellent, at least in summer. I consider that a light carriage, such as is here represented, could be propelled by a moderately strong man at the rate of six or eight miles an hour, on a level good road, with the weight of two other persons in it.

"The small wheel in front, D, is for the purpose of guiding and turning the Carriage. The rate of velocity would in a great measure depend on the person working it, but would be increased in proportion to the circumference of the wheels, A; it would admit of two or three persons working at it at the same time, if necessary.

"A person might thus, by way of œconomy in travelling, agree to work his passage, taking his turn at the wheel in preference to walking.

"It would also be particularly adapted to invalids unable to walk, to ride about within a park or garden, or even in a room, if made of a proper size.

"No. 2. Represents the same principle of motion adapted to a Barge or Boat, the only difference being that the wheels A, which have a double groove, act directly upon the other two, B and C; whilst in the carriage the wheels A act on B, which turn C.

"The paddle wheels attached to the Boat are very similar to those used by steam boats and packets.

"Vessels propelled in this manner might be adopted with great advantage on a river or canal, where heavy laden barges are frequently used, and would, I think, be preferable to dragging them by horses, as at present practised; all the wheels may be made to fix and unfix at pleasure, and others adapted, as be required. It might even be useful at sea in a calm; the steam packets, in case of any possible deficiency of fuel, might be adapted so as to be propelled in this manner.

"It may perhaps be objected, that the work in each case would be too laborious; to which I can only answer, that I consider it would be much less so than porter's work in the one case, and boatmen's in the other; by practice it would be rendered still more easy.*

"G. J. SMITHSON, R. N.

"*London, March,* 1825."

DAY'S PATENT BRASS-CASED KNOBS.

Mr. Benjamin Day, of Birmingham, has lately taken out a patent for a method of making knobs for locks, drawers, doors, &c. The

* Admitting the power to be sufficient in some circumstances, how will our correspondent turn round his carriage, the wheels upon both sides being driven with equal velocity by the apparatus described? Ed.

way they have heretofore been made has been either to cast them in one solid piece of metal (which makes them expensive): or to cast them in two semi-spherical or other shaped pieces, and join them together (by brazing) at the edges, and by these means make them hollow and more economical: other kinds are made partly of stamped or wrought metal and partly of cast metal. By either of the last mentioned methods they were rendered sufficiently cheap, but too insubstantial, to be satisfactory. To obviate the defects of the latter, and to obtain the solidity or strength of the former, the patentee makes them internally of wrought or cast iron, and externally of brass, by which means they will possess great strength and durability, and at the same time have the appearance of solid brass.

The faces of the knobs, usually called the roses or caps, are stamped out of plate iron in a heated state, and attached to the shank by means of screws or rivets; the coating of thin brass previously formed by die stamping is pressed on and made to overlap the edges of the iron.

In like manner rims and various ornaments in silver, brass, and other metals, may be attached to ebony or wooden knobs, by making the shank of the metal to pass through the wood and fastened to the same by nuts or other ordinary means.

MILLS AND FAIRMAN'S* PATENT

FOR RENDERING LEATHER, LINEN, FLAX, SAIL-CLOTH, AND OTHER ARTICLES WATER-PROOF.

The Patentees set out with observing, "The properties of this composition have been proved, by many trials, superior to any other process, hitherto practised in this country, for rendering linen, canvas, cotton, leather, and many other articles water-proof, on account of the peculiar elasticity it retains at all times, and the close adhesion to those articles to which it is communicated, not being liable to dissolve either by moisture or heat. A great objection to the present mode of preparing tarpaulins and covers for ships, and other uses, is the sticky and clammy nature of canvas when impregnated with the usual mixtures of tar, grease, and oil, which makes it adhere to the objects over which it is spread for covering, and causes much difficulty in handling such covers, as they stick together when rolled up, particularly in warm weather, or when kept in confined places. On the other hand, the usual compositions for manufacturing oil-cloths, or the paint applied to linen, for various purposes, is known to become very stiff soon after exposure to the air, and to crack and peel off from the excess of dryers, which destroy the oleagenous and nourishing properties necessary to preserve the adhesive quality of the composition, and the pliability of the articles to which it is applied. Our composition fully obviates these imperfections, as it becomes sufficiently hard and dry to prevent stickiness, yet retains a

* Mr. Mills, of St. Clement Danes, and Mr. Fairman, of Silver Street, London.

desirable degree of elasticity and pliability without any disagreeable smell; it penetrates and fills the threads of the linen, as well as covers the interstices, without injuring the texture, from the nature of the pipe clay, which is less corroding than other articles generally used in manufactories of this kind.

This composition consists of a combination of pipe-clay and oil varnish, which is effected in the following manner. In the first instance the varnish is prepared by mixing linseed oil, at the rate of 100lbs. with 6½lbs. of saccharum saturnal,* 1¼lb. of burnt amber, 1¼lb. of white lead, 1lb. of fine white pumice stone (all these articles being previously well pounded and ground), and boiling the whole together, for ten hours over a slow and regular fire, taking care to increase the heat by degrees during the latter two hours, but not so much as to let the oil run thick, which it is subject to do, if not carefully watched. This practical part of the process can only be acquired by experiment and observation, as much depends upon the nature and quality of the oil, which, if adulterated with any other mixture, will not stand boiling without turning into a thick coagulated substance; whereas this varnish should remain sufficiently liquid to unite two third parts with one third part of the pipe clay, and yet to constitute a fluid of the consistence of molasses. After this varnish has been suffered to settle for at least a week, it is drawn off, and strained through muslin, or other suitable fabric, in other vessels. A quantity of pure pipe clay, equal in weight to one-third of the clarified varnish, is next to be pounded and sifted, and put into a wooden tub or other vessel, where it is gradually mixed and stirred up with so much thin glue water, till it becomes to the consistency of a thin salve, after which the varnish is gradually added, being continually beat and stirred with wooden spatulas: when thus well mixed up together, the whole is ground upon a colour-mill repeatedly, until it runs out in the state of a thin liquid. Any colour may then be given to this composition, by grinding oil colours in the aforesaid varnish, and adding the same in the proportion of one-fourth of colour to three-fourths of the composition.

The linen or other articles having been extended in wooden frames, the composition is then spread thereon with large knives (made of cast steel, three inches wide and eight inches long, or other convenient size), so as to soak in well and close the interstices, giving a smooth and even surface on one side. The frame is then turned round, and the other side of the article being covered with the composition in like manner, is put up to dry for about a week in general, after which the articles may be taken out of the frame and are ready for use.

Our canvas, linens, and calicoes, prepared in this manner, will be found peculiarly adapted for tarpaulins, awnings, coach-top covers, boat-cloaks, sea-coats, and all similar uses requiring to be water proof, as likwise the leather for boots and shoes, and other general uses.

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* Sugar of lead.

A gloss or lacquering can be given to the articles by the following means, which we likewise claim as our own peculiar process ; 50lbs. of the above varnish is gently boiled with 5lbs. of clarified rosin until the rosin is dissolved, and when cooling, 2lbs. of turpentine are added to it. Any colour corresponding with that already on the articles, must then be well ground, and mixed up with this composition, which is next strained through muslin again. When the articles are perfectly dried, the frames are again laid on a pair of tressels, and the linen or leather is rubbed down with pumice-stone and water ; and after being well washed with clean water and a sponge, it must be suffered to dry again. Two or three coatings of the last mentioned japan are then successively laid on, with large brushes or otherwise, each coating being dried for two or three days, so as to become perfectly hard and polished.

DALLAS'S PATENT APPARATUS FOR PECKING OR DRESSING STONES.

This is a very simple machine which the patentee proposes to employ for the purpose of pecking or chipping stones, instead of the common mallet and chisel of the workman.

A long bar is placed horizontally between two upright supports, and connected to the same by a bolt or pin passed through, which forms an axis and a fulcrum for the lever or bar to work in. The bar is thus divided into two parts, the longer end being left about two thirds of the length, and the shorter consequently about one third of the length. Near to the extremity of the longest, are fixed the peckers or chisels; which act by the bar being alternately raised and let to fall with its weight upon the stone placed underneath. This action is produced by the revolution of a break wheel, the blocks or teeth upon the periphery of which strike against the short arm of the lever, and by depressing that end, they raise the other, which being immediately afterwards released, falls with great force with the peckers upon the stone. By the continual motion of the wheel the lever is thus incessantly raised and let to fall with great rapidity. The wheel may obviously be turned either with a winch by hand, by a band from a horse wheel steam engine or water wheel. The stone is placed upon a truck adapted for moving it in any required direction as the peckers are working upon it, and for this purpose the handle is held by a workman. The peckers are made of various forms, to suit different kinds of work, and by fixing a chisel in the lever and moving the track backwards or forwards in one straight line, the stone may be cut into two parts, or any portion may by similar means be soon cleared off.

Higgin's Patent for consuming Smoke.—This invention simply consists in the introduction of an additional furnace in some part of the flue leading from the ordinary furnace from which the smoke emanates, and to burn in the former coke, cinders, or other fuel which does not emit smoke.

BLEACHING OF IVORY.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I shall be much obliged to you, or any of your correspondents, to advise me the best method of bleaching or whitening Ivories, preparatory to painting on them.

"I am, Sir, Your's,

"*April 26th,* 1825. "AN AMATEUR MINIATURE PAINTER."

QUERIES IN THE ARTS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I SHOULD be much obliged to any of your correspondents for information respecting the following queries :—

"1st.—What is best for taking out ink on paper without leaving any mark, and so that it may be written on again without running, and the manner of application ?

"2nd.—What is the best lye or other solution for cleaning type after printing ?

"3rd.—What are the different processes and materials used in that branch of Lithography by which circulars, &c. are printed, and the name and price of the cheapest work which treats upon that subject :—and

"4th.—What is the best method of copying letters, &c.

"I am, Sir,

"Yours, &c.

"A WELL-WISHER."

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

THE LATE DREADFUL INUNDATION AT PETERSBURG AND NEIGHBOURING PARTS.—This very remarkable phenomenon has been generally ascribed to some subterraneous convulsion, which is rendered probable by the sudden elevation and depression of the sea at Christiana, by the spontaneous breaking forth of new springs in the upper and lower Rhine ; by crevices that have been opened in the solid ground by a slight earthquake which was experienced at Portsmouth and in the Alps ; and by the volcanic eruption of Donnersberg, which for the first time discharged flames and ashes.—*Brewster's Journal.*

It is proper that we should not omit to record a concise and authentic account of its devastations. The storm commenced in England and Holland, proceeded to Stockholm, where, on the 19th of November, the vessels were torn from their moorings and dashed against each other ; twenty-five ships were thus carried away and sunk. Similar effects were produced at Gottenburg, and other ports. At Udwalla whole houses were swept away, and ships were thrown into the fields 4000 feet from their anchorage, and one vessel of 150 tons was

wrecked in the middle of a street. An analogous occurrence took place at St. Petersburg at the same time; a large brig being left, overset in the middle of the street, Grand Perspective. Near Catherinoff a whole village was carried away. At Cronstadt the imperial fleet of twelve ships and four frigates were wrenched from their moorings and dashed upon the coast; one of them of 100 guns disappeared entirely. The batteries were wholly raised in some places, in others greatly injured; the gun carriages were taken from under the guns and carried away by the waves. A whole regiment of carabineers with their horses were drowned; the unfortunate men ascended the roof of the barracks for safety, but they were all swept off by the fury of the waters. At the foundry of M. Clark, the workmen had to bear the sight of seeing their habitations, containing their wives and children, all swallowed up by the sea. The loss of property is estimated at 150 millions of roubles.

Colouring and Pointing of Brick Houses.—To give a new or clean face to old and dirty brick buildings, it is usual to colour them with a yellow wash and afterwards to point the bricks afresh; a less expensive and very effectual mode has been adopted by Mr. Snowden, of Oxford Street, which is that of rubbing or rasping the surface with a rough implement, thus giving it the appearance of new brick-work.

Tanning.—The extract of mimosa bark from New South Wales, is now likely to be extensively employed for the purpose of tanning as a substitute for oak bark. The tanning matter exists in the former bark in greater proportion than in the latter, and the leather made from it is of good quality and of a fine colour. Mr. Kent's method of preparing it at Sydney, in the above mentioned colony, is as follows. Take a quantity of mimosa bark, stripped from the trees in the spring months, that is, in August, September and October, and, after the rough or outward coat is cut off, and whilst green, crush it by passing it through a mill constructed upon the principle of those mills used in the crushing of the sugar cane,* but with this difference, that the rollers should be made of copper, and may be fluted. This done the crushed bark is put into a copper boiler of clean water, in the proportion of 100lbs of crushed bark to 100 gallons of water, and boiled gently two hours; after which run off the decoction into broad flat copper pans, through a sieve or other strainer, and evaporate to the consistence required.

One ton of bark produces four hundred weight of extract, when brought to the consistence of tar, and if concentrated to a hard substance as pitch, the produce is three hundred weight; but the evaporation, if carried to this extent, is liable to scorch and partially char the extract, and therefore is to be avoided.

New Portable Pump.—A gentleman of Liverpool, Mr. W. Tyror, has lately invented a portable pump and fire extinguishing engine, for which he has obtained a patent, and which is said to exceed in

* A description of one of these mills for expressing the sugar cane, with an engraving, is given in vol. ii. page 19 of this work.

ingenuity all the works of the kind yet offered to the public. A moderate sized pump on this plan, which can either be worked by hand or by the wind, having a rotatory motion, will raise water out of a ship's hold 29 feet deep, at the rate of two tons a minute, and in hot climates has the advantage of answering the purposes of an air-pump.

GEOGRAPHY OF PLANTS.—It is the opinion of M. Pastié, an ingenious Frenchman, that the medicinal properties of plants depend much more upon the nature of the soil in which they grow than upon the genus to which they belong, or even to the chemical principles which enter into their composition. He remarks as an instance in support of his theory, that all the plants which grow on high grounds and in dry and cold places are of a tonic, acid, and stimulant power, while those which grow in low and moist grounds possess the contrary properties.

RECENT PATENTS.

IMPROVED BATH.—To R. Hicks, Esq. of Conduit-street, for an improved Bath. Sealed March 22, 1825.—Two months.

TRACING APPARATUS.—To F. Ronalds, Esq. of Croydon, Surry, for a new Tracing Apparatus to facilitate drawing from nature. Sealed March 23, 1825.—Two months.

LIGHTING BY GAS.—To R. Wilty, of Hull, York, Engineer, for a new invented and more economical method of Lighting by Gas. Sealed March 25, 1825.—Six months.

WEAVING.—To J. Hanchelt, of Crescent Place, Blackfriars, and Joseph Delvalle of Whitecross Street, Esquires, for improvements in Looms for weaving of Silk and other kinds of Cloth. Sealed March 25, 1825.—Six months.

GUN SHOT.—To Joseph Manton, of Hanover Square, for a certain improvement in Shot. Sealed March 25, 1825.—Six months.

CHRONOMETERS.—To J. G. Ulrich, of Bucklersbury, for certain improvements in Chronometers. Sealed March 25, 1825.—Six months.

PEARL SHELL WORK.—To Aaron Jennings and John Belteridge, of Birmingham, Japanners, for a method or methods of preparing and working Pearl-shell into various forms and devices, for the purpose of applying it to ornamental uses in the manufacture of Japan ware and other articles. Sealed March 29th, 1825.—Six months.

SPINNING.—To Richard Roberts, of Manchester, Engineer, for various improvements in Spinning Machinery. Sealed March 29, 1825.—Six months.

CALICO PRINTING.—To J. H. Baker, Esq. of St. Martin's Lane, Middlesex, for certain improvements in the art of dyeing or printing Calico by the use of certain vegetable materials. Sealed March 29, 1825.—Six months.

SPINNING.—To Maurice de Jongh, of Warrington, for improvements in Spinning Machinery. Sealed March 29, 1825.—Six months.

DRESSING WOOLLEN CLOTH.—To Edward Sheppard, and Alfred Flint, of Uley, Gloucester, for a new invented series of improvements in machinery employed in the several operations of dressing Woollen or other Cloths. Sealed March 29, 1825.—Two months.

HINGES.—To R. and J. Whitechurch, of Chancery Lane, carpenters, for an improvement upon hinges, whereby doors and sashes may be opened on the right and left jaumb by changing the hinges.—Sealed March 17, 1825.

TO READERS AND CORRESPONDENTS.

A. Z. has been misinformed.

Communications from J. P.—W. BEAN.—I. COLERIDGE.—AN ARTIFICER—W. P. and I. M. are received.

We thank H. W. for his valuable hints, by which we will endeavour to profit.

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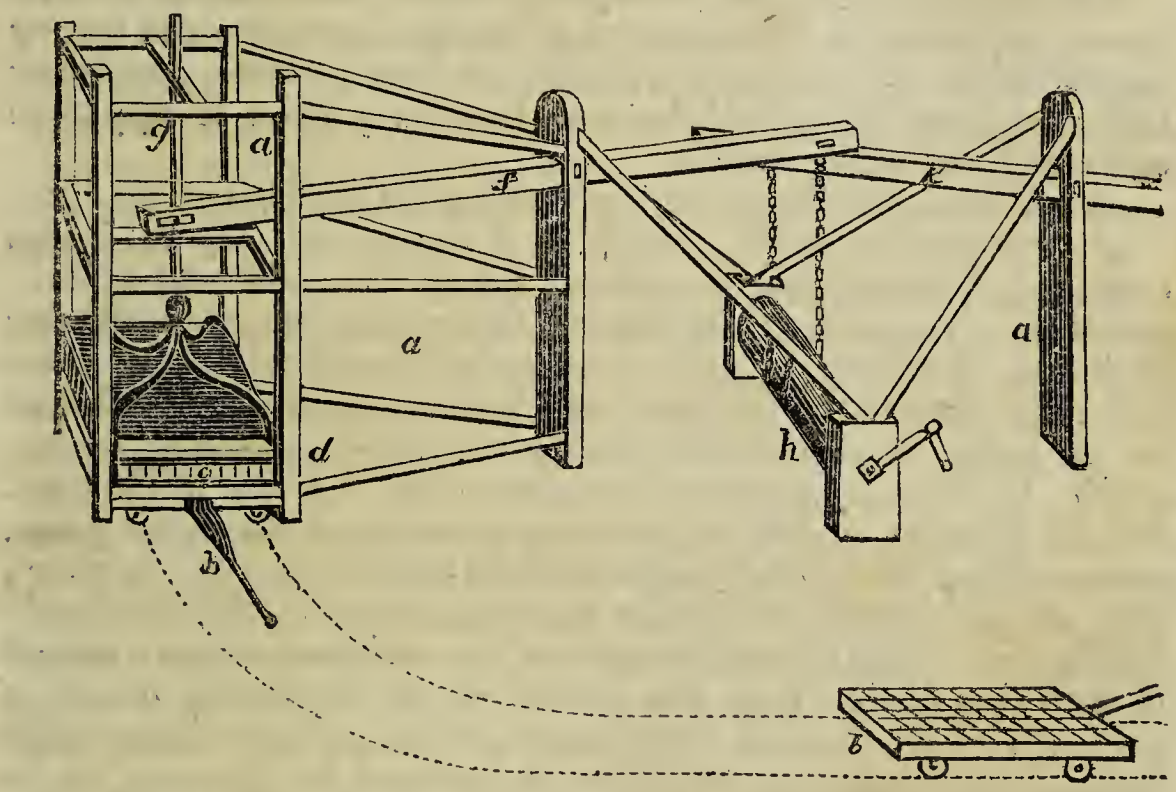
CONTENTS:

Patent Brick-making Machine 305
Culture of Silk in the Isle of Fra. 307
Locomotive Carriages 308
To measure Light 309
" Wooden Marbles" 311
Duce's Quadruple Lock. 311
Ayliffe's Smoke Preventive 313
Encyclopædia of the useful Arts 315
Wheatstone's Patent Piano-Fortes, &c. 318
Manufacture of Telescope Glasses 318
Letters of Enquiry 319
List of New Patents 319
Correspondence ..... ib.



MR. CUNDY'S PATENT BRICK-MAKING MACHINE.

It has often been to us a matter of astonishment, that in the process of making Bricks no improvement of any consideration has been made during a period of nearly four thousand years; and that only very recently a half-civilized country, Russia, should have taken the lead in the application of machinery to expedite and facilitate the work. In 1822 a Russian patent was granted to M. de Chomas for an invention of the kind, after having been submitted to an imperial commission appointed to examine into its merit and public utility.* In this country several patents have been taken out from time to time for modifications of the ordinary apparatus, as well as for an improved *form* of brick, among which is particularly deserving of notice, the invention of Mr. Cartwright, in 1795, of the grooved bricks,

* See an account of this, vol. i. page 332 of this work.

whereby they are made to lock one into the other, and thus make a more solid bond than can *perhaps* be done by any other method. It is, however, only within these few months that apparatus on an extensive scale has been brought into use for accelerating the *moulding* of bricks, which is of course the principal operation in the manufacture.

Having been favoured with a sight of the new patent machine invented by Mr. Cundy (architect, of Princes-square, Kennington), for this purpose, and witnessed the great simplicity and effectiveness of its operations, we have been solicitous to lay an account of it before our readers.

The above engraving gives a perspective view of one half of the apparatus, the other half being precisely a counterpart of that shewn: they are acted upon at the same instant by the power of one man at a windlass, producing an alternating motion like that of a scale beam; so that while the apparatus on one side is pressing and cutting out the bricks, the other has relieved them from pressure, permitting the removal and the re-introduction of a fresh portion of clay to be operated upon in like manner.

a a a is a strong frame work containing the machine.

b a carriage or truck, containing a stratum of clay 2½ inches deep, and of the requisite length and breadth to make 50 bricks; one of these trucks is shewn also at *b* in a separate figure, containing 50 bricks, supposed to have been made immediately before those under operation in the machine, and in the act of being wheeled off to the hacks on a suitable railway;—*c* are the *moulding sectors*, which, by means of pressure from above, cut the clay in the truck beneath into the 50 bricks; at *d* are a series of 50 metal plugs, connected together at their upper surfaces by a strong cast iron plate; each of these plugs are of the size of a brick, and fit accurately within each square or parallelogram of the moulding sectors, and all of them thus resting upon the surface of the clay during the act of cutting, give the requisite compression and consequent solidity to the bricks. Another important effect is produced by this very simple apparatus, which is, that when the sectors are lifted up, after having cut through the stratum of clay, the plugs press out the bricks, by re-occupying their places, which leaves them all on the truck beneath perfectly formed. *e* is an iron frame or chamber, to be loaded with weights, to give the requisite pressure to the sectors; the latter are connected to the sides of the same frame, leaving an open space between the sectors and loaded chamber for the plugs (before-mentioned) to rise up when the moulds are filled with the clay; for it should be perfectly understood that the plugs press solely by their own weight upon the upper surface of the bricks, while the loaded chamber gives the needful force to the cutters (or *sectors* as they are termed). *f* is a beam or lever, to which an alternating motion being given by the windlass *h*, thus raises and depresses the perpendicular rod *g*, and with it the apparatus already described.

It will be noticed that the beam is connected to the windlass by means of a chain, which passing round its cylinder, is attached at

the other end to the beam of another precisely similar machine. The windlass may be worked either by a winch as shewn, or by a handspike as on board of a ship;—or by any first mover, as may be desirable: but the power of one man is adequate to the making of 50 bricks at every half turn of the windlass. By this felicitous combination of simple machinery, it is evident that the reciprocal motion of the beams causes one of the machines to cut out the bricks, while the other delivers them from the moulds, and the weight on each machine being thus counterbalanced, the requisite force at the winch is rendered uniform and regular.

CULTURE OF SILK IN THE ISLE OF FRANCE.

(From the Transactions of the Society of Arts.)

A short time before the conquest of the Isles of France and Bourbon by the British, the French ministry had formed the project of introducing the culture of silk into those islands. A sum of money had been assigned to this purpose, and the persons to whom the execution of the plan had been entrusted, had already arrived. From causes which have not been explained the attempt failed.

Sir R. T. Farquhar having been appointed governor, renewed the attempt. He procured silk-worms' eggs from Bengal, and on the 20th of December, 1815, entrusted them to the care of M. Chazal. By the 20th of March, in the following year, about 80,000 coccoons had been obtained, 25,000 of the best of which were selected to afford eggs for the next season. The remainder of the coccoons being wound off, afforded about 180 ounces, French, of silk.

The increase of the silk-worm is much more rapid than that of the mulberry, on the leaves of which it feeds. M. Chazal, accordingly, applied himself strenuously to the establishment of plantations, partly of the white mulberry, and partly of the mulberry of Bengal. The plants were put into the ground at the distance of about three feet apart, and were not allowed to grow to a greater height than four or five feet, for the convenience of gathering the leaves. As the plants get old, they will require to be cut down to the ground, in order to obtain vigorous new shoots, and, in a well-regulated plantation, a certain proportion will thus be treated every four years. By the end of the year 1817, M. Chazal had completed plantations of the extent of forty arpents, containing about 200,000 mulberry plants.

The warm and generally temperate climate of the Isle of France admits of the silk-worms being much more exposed to the weather, than they can be either in France or Italy. M. Chazal has therefore adopted the Indian, in preference to the European, mode of management, as being equally efficacious and much cheaper.

The houses or sheds in which the silk-worms are kept, are composed of lattice-work, plastered over with a mixture of clay and cow-dung, covered with a thatched roof. Their breadth is about fifteen feet, their height eight feet, and their length is regulated by

the number of worms to be accommodated, and other circumstances. In the middle is a path of a convenient width, and on each hand are tiers or stages of open frames, or shallow boxes made of bamboo, in which the worms are placed; eight inches in height are sufficient for each frame, including the space between that and the next, so that the house contains twelve stages. Each worm when ready to spin is transferred to a small cell made of platted bamboo, as practised in Bengal.

The worms hatched from the eggs brought from Bengal, whether they had suffered from the voyage, from the change of climate, or other circumstance, did not attain to the size natural to them in India, and afforded but little silk; those of the second generation, however, produced from eggs laid by the imported worms, were both larger and yielded a better produce of silk both in quantity and quality. The fourth generation appeared to be perfectly inured to the climate and mode of management, and were not inferior to those grown in Bengal.

There are five generations of silk-worms annually in Bengal. In the Isle of France M. Chazal obtained three generations from December to May, and the mulberry affords fresh leaves during the whole year.

In 1817, M. Chazal, besides distributing silk-worms to various persons in the colony, collected more than 200lbs. of silk, of which one bale, weighing 116lb. 6oz. was sent to England in the year 1818; and in the spring of 1819, M. Chazal's claim to the premium offered by the Society was sent in. The want of official documents, and the time required to obtain them from so distant a colony, as well as other circumstances, have occasioned the delay in the adjudication of the claim.

The requisite documents having been at length received, the Society during their last sessions presented their LARGE GOLD MEDAL to M, Chazal, being the premium for raising upwards of one hundred pounds of silk in that colony.

In order to ascertain the quality of M. Chazal's silk, the committee directed that the samples sent to the Society should be put into the hands of Mr. Winkworth (of Paternoster-row), a member, and silk manufacturer. This gentleman, besides carefully examining the silk himself, shewed it to some of the most eminent silk brokers in London, and they all agree in opinion that it is a very saleable article in the market, worth at the present time from eleven to fourteen shillings per pound, exclusive of duty.

LOCOMOTIVE CARRIAGES, &c.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"OBSERVING in No. 43 of your valuable Register, 'A New Method of Propelling Vessels on Land and Water by Manual 'Labour,' by Mr. G. R. Smithson, R. N., I beg leave to say that

have had a drawing remaining half finished this four months, for want of time to complete it, which was intended for your Register, similar in principle, but differing in mechanism from the one in question, which I will now describe as well as I am able without the drawing.

"I proposed to build a *very light* kind of four-wheel chaise, with a seat for two persons, having also a dickey or seat behind for one or two persons; in front of whom is a crank, fixed in uprights on each side of the chaise: on the axle of the crank is fixed a wheel with twenty-four cogs or teeth, driving a pinion* of eight teeth fixed on the axle of the hind wheels, which are also fixed to the axle and revolve with it. The persons seated behind turn the crank, which driving the pinion, propels the carriage along, and is guided by those in front by a handle, connected with the fore wheels in the usual manner.

"I perfectly agree with Mr. Smithson, in his list of the advantages which would result from the use of carriages of the above description. "I remain, yours respectfully,

"10, *George Yard, Lombard Street,* "W. B. Jun."

"*May* 11, 1825.

TO MEASURE LIGHT.

When it is required to compare the intensities of light produced by candles of different sizes, the following mode may be adopted. Fix a sheet of white paper against the wall of your room at a convenient height, and place a small fire-screen at a few feet distance from it, taking care to fix the part intended to throw the shadow upon the paper, at a proper height for doing so; then let one of your assistants take the candle which yields the smallest quantity of light, and proceed to such a distance from the screen as may be convenient, but so as to allow the shadow to be produced to fall upon the paper. Next, let him who holds the candle yielding the strongest light, proceed in nearly the same direction from the screen as the former, till the shadow from his candle falls nearly upon the same part of the paper as that produced by the weakest light, should the darkness of shadow from the strongest light be greater than that produced by the weaker, let your second assistant increase his distance from the interposing object, till the shadow from each candle is equally dark; this being done, measure the distance of each light from the paper receiving their respective shadows; then say,

As the square of the distance of the weakest light from the shadow
Is to unity:
So is the square of the distance of the strongest light from the shadow
To the proportion of light it yields in comparison with the former.

* Where *power* is required instead of velocity this arrangement must of course be reversed.

But by way of example, let us suppose we have proceeded agreeably to the plan already pointed out, with two candles of different illuminating powers, and have measured the distances of each from the shadows, and found the weaker light to be at six feet distance from the shadows, and the stronger light at twelve feet, and desire to know how many candles of the least illuminating power, if placed in the same situation as to distance from the interposing object, as the strongest light would produce a shadow equally strong and consequently yield the same quantity of light.

The square of 6 is equal to 36
Do..... 12..... 144

therefore as 36 as 1 : : 144 to 4 the number of candles of the smaller illuminating power which would be required to be all lighted at one time, and placed close to each other to produce the same intensity of light with the larger candle.

Having adjusted the flame of a gas burner to two inches in height, and placed an opake body between it and a sheet of white paper attached to a wall twelve feet distance from the burner, a mould candle, of six to the pound, was introduced between the burner and the body producing the shadow, and moved backwards and forwards till the shadow produced by the gas burner and the candle were equally dark; on their being so, the candle was found by measurement to be 49.10ths feet from the shadow produced; the number of such candles that would produce as much light as the burner gives, are required to be known.

The square of 4.9=24.01
12.0=144.00

Then as 24.01 : 1 : : 144 : 6 nearly, the number of candles necessary to produce the same intensity of light as is afforded by the burner.

It has been determined by experiments made by Count Rumford, for the purpose of ascertaining the quantity of materials necessary to produce a light of a certain intensity, for a given time, that there must be burnt by weight,

Of wax	100	pounds.
Tallow.....	101	do.
Oil in an argand's lamp ..	129	do.
an ill-snuffed tallow candle	229	do.

and from various experiments made on the gases obtained from coal and from oil, I am enabled to state, that to procure as much light as is afforded by 100lbs. of wax would require.

Of coal gas	5450	cubic feet
Oil gas about	2000	do.

The comparative cost of the different modes of lighting will therefore stand thus:

	£.	s.	d.
100lbs. of wax candles, at 2*s.* 8*d.* per lb.	13	9	4
101 .. of best Kensington mould candles, at 8*d.* ..	3	7	4
129 .. of oil (spermaceti) at 5*d.*	2	13	9
229 .. of ill-snuffed tallow candles dips, at 7*d.* ..	6	13	7

5450 cubic feet of coal gas, at 6*s.* per 1000 cubic feet	1	12	8½
2000 ditto of oil gas, at 28*s.* ditto	2	16	0

Peckston on Oil and Coal Gas.

WOODEN MARBLES.

(A COMMUNICATION.)

A French gentleman, M. C. Malo, at present in London (No. 20, Newman-street), has discovered the secret of imitating, by means of a peculiar wooden paste (without any inlaid work or incrustation), the most precious and rare sorts of natural marbles, and creating, according to the dictates of fancy or imagination, such different sorts of marble as nature does not produce.

Up to this period, marble could only be obtained from nature, but in future, by the use of this invention, the richest and rarest marbles can be produced, with those thousand accidental fusions, veins, shades, and transparencies, &c. which the ablest painter can but imitate *on the surface,* with great expense, and after all, insufficient in its execution as well as in result. The patent marbles can be made of any size or *thickness,* and with a charming perfection.

The substance of this composition is of the greatest solidity, and does not want any re-touching or amelioration for many years. It can be washed and cleaned with an ordinary sponge. In case of accident, or many years wear, it can be scaled and renewed in the same way as common wood. The shavings thus taken off will shew every vein of marble thus imitated, leaving the underpart with all the veins, shades, and polish entire, and without, in any way, injuring the finish or beauty of the workmanship.

This discovery opens an immense field in England to all the manufacturers of cabinet work, ornamental architecture, and, in fact, not only wherever marble can be used this imitation can be adopted; but it can be made use of in the manufacture of the smallest articles, as well as in objects of the greatest dimensions.

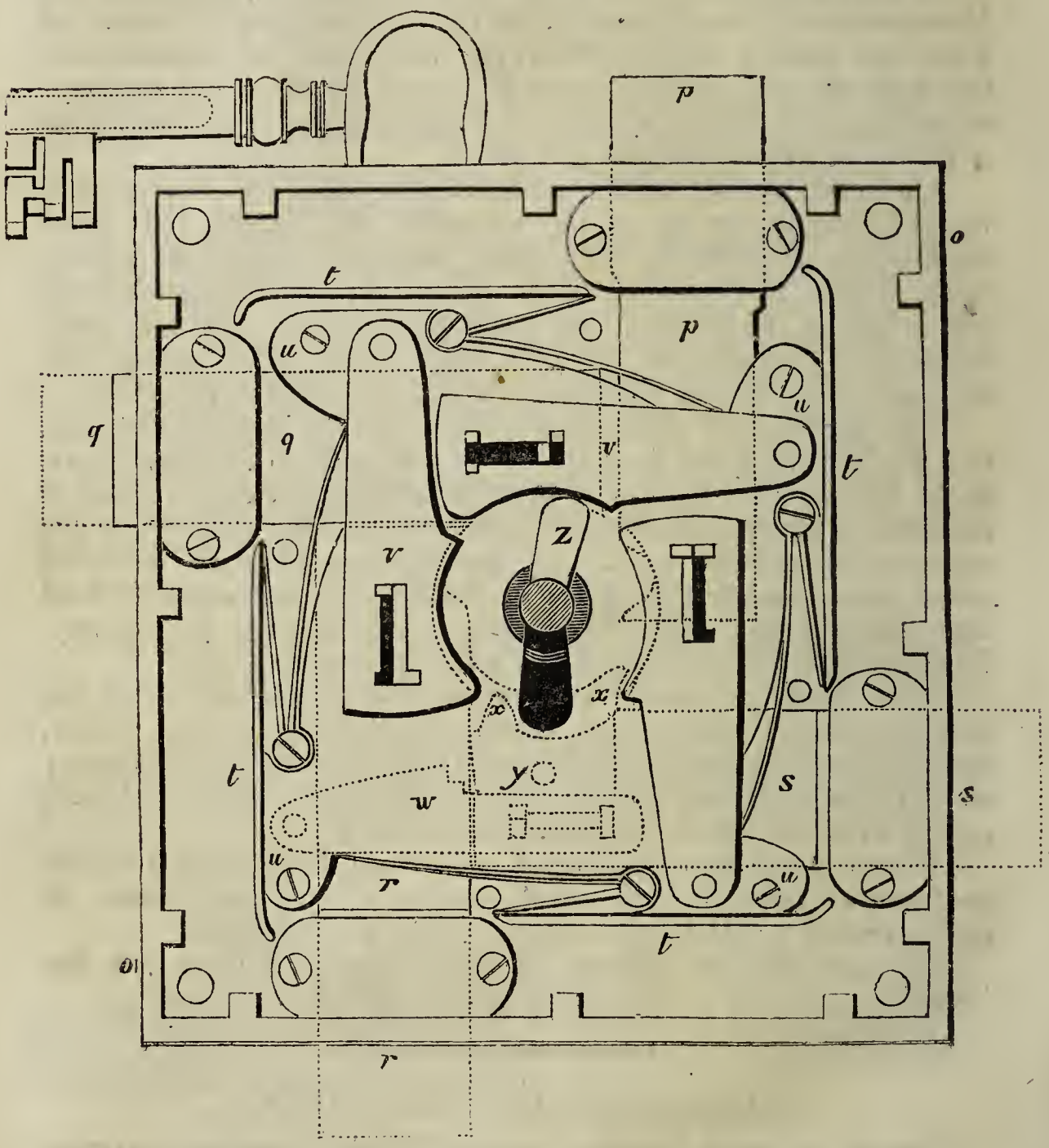
Wherever the most magnificent marble may be required it may be produced with veins of gold, silver, mother-o'pearl, and, indeed, it can be enriched with all the wonders of the mineral world.

It is said, that the inventor of these wooden marbles has the intention to *dispose of his secret* or patent-right for this country.

DUCE'S QUADRUPLE LOCK.

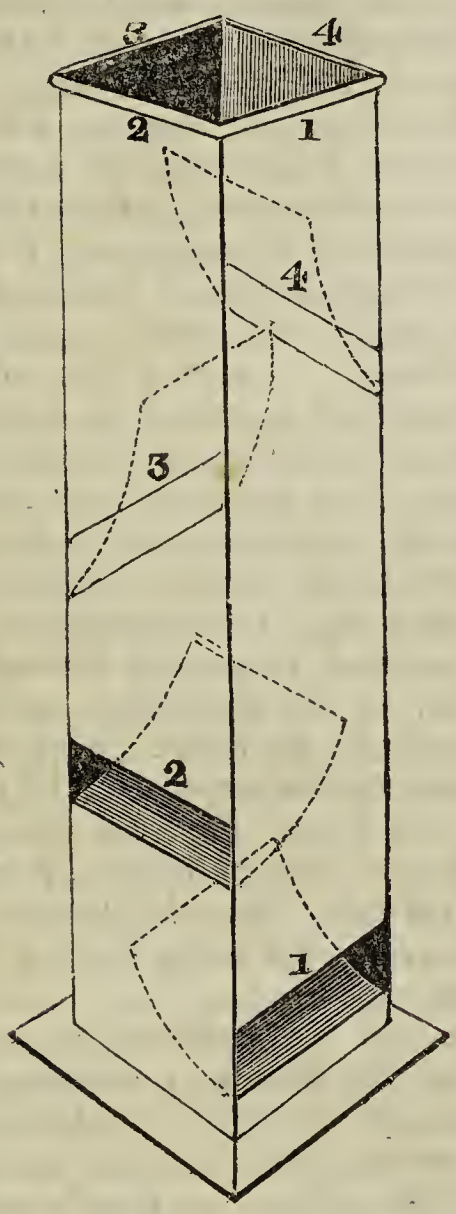
By this ingenious invention is effected a very great improvement upon those locks which throw out several bolts at once, commonly used for securing iron safe or bookcase doors, but which in reality afford no more security than if only one bolt were employed, as they are all moved simultaneously by the same action; so that the picking of the lock, or the thrusting back of one of the bolts thrusts back the whole. Mr. Duce's lock, however, possesses the same advantages as four distinct locks, and confers the same security; the several bolts

are not shot at the same moment, but successively, as the key passes them; and by certain variations in the disposition of the tumblers or the parts operating upon them, the difficulty of picking is equal to that of picking four of the most improved locks, on Barron's and Chubb's patent principles. Thus, while the security of the lock is quadrupled by Mr. Duce's invention, the labour or strain upon the key and wards is lessened in the reverse proportion.



Reference to Engraving.—*o o* the case, *p p* the first bolt, *q q* the second, *r r* the third, and *s s* the fourth bolt; the upper plate is removed, and the lock rests on the inner casing *t t t t; u u u u* an inner plate, *v v v* three tumblers lying on it for the first three bolts; beneath each of these tumblers, and under the plate, *u u,* are two more tumblers, making three for each of these bolts; the last bolt *s s* has but one tumbler *w,* placed under the plate *u u,* which is moved

by the corners of an intermediate piece *x x*, which turns on the pin *y*, as is shewn by dotted lines: the key *z* is represented as having thrown out the first bolt *p*, and beginning to protrude the second *q*; it then acts on the bolt *r*, and lastly on the bolt *s*, moving them to places shewn by dotted lines. It withdraws the three first bolts in a reverse order, but finishes with the last *s s* in either case.



AYLIFFE'S IMPROVED COWL OR SMOKE PREVENTIVE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I WAS much pleased to observe in a late number of the Register, that my neighbour's ingenious improvement upon the common weighing machine* had fallen under your observation, feeling assured that it deserves the encomiums you bestowed upon it.

"Having recently noticed another little invention of the same

* An account of this useful machine is given in our 35th number.

person's, which appears to be perfectly novel and of considerable merit, I beg leave to lay it before you, requesting you will use your own judgment as to its fitness for insertion in the Register of Arts; being desirous to contribute all in my power to so useful a work.

"It consists of a very simple apparatus to be employed as a cowl or smoke preventive. By the above drawing I have endeavoured to give an intelligible representation of the thing, which I hope to make quite plain by the following description. A square tube of iron, tin plate, or copper (or even wood would do) has an opening on each side, of the dimension and situation of those shewn at 1, 2, 3, 4; which are equi-distant. Two of them, 3 and 4, are necessarily shewn by dotted lines, as they are on those two sides of the tube hid from view, but their situation will perhaps be better understood by reference to the upper end of the cowl, where the four sides are seen in perspective, and numbered in consonance with the former. These four apertures are for the purpose of receiving the wind from whatever quarter it may blow, and render it subservient to driving the smoke out of the chimney. A curved piece of plate-iron (supposing the cowl to be made of that metal) of the full breadth of the aperture and of the form shewn, is fixed upon a pivot or axle passed through the tube as a bearing, thus forming a joint upon which they may be turned back against the aperture to enable the chimney to be cleaned without their obstructing the passage. Their position in ordinary is that shewn in the drawing. In calm weather the smoke freely ascends the chimney as usual, in passing through the cowl a serpentine course is given to it, by the intervening curved plates, which cross one another in succession; by which circumstance alone it is considered that the draught is increased; and I think it is evident, that however light the wind may be from any quarter, by the curved plate directing it in an upward course, it cannot fail to increase the velocity of the current. Admitting this to be the case, the effect will be increased in proportion to the force of the wind, and carry off the smoke with great rapidity.

Another advantage of this construction is, that the wind cannot blow the smoke down the chimney; whatever blows into the cowl drives out again through the upper apertures, and with it whatever smoke it comes in contact with, leaving free egress for the smoke unoperated upon by the gust to pass quietly out at No. 1 or 2. This effect was proved to me by the inventor, who has a little tin model lying upon his counter; in fact, I proved it myself by blowing with the mouth at the upper end at a lighted candle placed at the other, which did not disturb the flame; upon reversing the tube it was extinguished by the slightest puff. No rain whatever can get down a chimney provided with this cowl, as it is invariably turned out at the apertures in the side of the tube. The simplicity and consequent cheapness of the cowl is, I think, an additional recommendation to it.

"Your obedient Servant,

"*Tysoe Street, Wilmington Square,* "J. L."

"*May* 1, 1825.

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. IX.—*(Continued from page 239).*

ANCHOVY.—The little fish known by this name is too well known to the majority of our readers to need a particular description. They are commonly obtained in the Mediterranean on the coasts of France, Spain, and Italy. The principal fishery is at Gorgona, a small island to the west of Leghorn. The fishing for anchovies is chiefly carried on in the night time; a light being put on the stern of the vessels, the fish flock round and are caught in the nets. When the fishery is over, the heads are cut off and the insides cleared out; then laid into barrels and salted. To prepare them for sauce, they are boned, stripped of their tails and fins, and dissolved over the fire. Anchovies should be chosen small, fresh pickled, white on the outside, and red within. They should have a round back, for those which are large or flat are of a spurious kind. Sprats, from their similarity, are often pickled and fraudulently substituted for anchovies.

ANCHUSA, ALKANET OR BUGLOSS, a genus of the monogynia order, and petandria class of plants, the root only of which is employed, and is known in commerce generally by the term *alkanet root.* It is a native of the warmer parts of Europe, and cultivated in some of our gardens. Great quantities are raised in Germany, Italy, and France, particularly at Montpelier, from whence this country is chiefly supplied. The root is of red colour without and white within, the colour chiefly residing in the bark. It imparts a fine deep red to oils, wax, and all unctuous substances, and also to alcohol; the aqueous tincture is of a dull brownish colour. Wax tinged with it, and applied on warm marble, stains it of a flesh colour, sinking deeply into the stone. The spirituous tincture gives it a red stain. The colour of this root being chiefly confined to the bark, the small roots contain the most colour as they contain the greatest proportion of bark. For colouring unctuous substances, they are first liquified by the heat of a water bath, the powdered anchusa added by degrees, well stirring the mixture, till sufficiently coloured, then strained through a linen cloth.

ANEMOMETER.—An instrument for the purpose of measuring the strength and velocity; for a description and engraving of one—SEE *our 1st vol. p.* 280.

ANEMOSCOPE.—A mechanical instrument for determining the course as well as the velocity of the wind. It usually consists of an index, moving about an upright circular plate, like the dial of a clock, on which the 32 points of the compass are drawn instead of the hours. The index, pointing to the divisions in the dial, is turned by an horizontal axis, having a trundle-head at its outer extremity. This trundle-head is moved by a cog-wheel on a perpendicular axis, on the top of which is fixed a vane, that moves with the course of the wind, and gives motion to the whole of the machine. The whole contrivance is extremely simple, and only requires that the number of cogs in the wheel and rounds in the trundle-head be equal, because

it is necessary, that when the vane moves entirely round, the index of the dial should also make a complete revolution. An anemoscope of this construction is placed in one of the turrets of the queen's palace.

ANGLING is the art of catching fish by means of a rod, to which is attached a line, a hook, and a bait. Although it is an art generally practised for amusement, it is, nevertheless, one that furnishes a considerable portion of the food of many families; and we consequently think it should have a place in our Encyclopædia which is especially devoted to giving an account of the "*useful* arts."

There is no art the practice of which appears more simple, at first view, than that of angling, yet there are few which require more nicety and precision; nor is there any for which it is more difficult to give precise rules. There is a species of acquired knowledge, amounting to a knack, that constitutes a successful angler, but which he can with difficulty impart to others.

The angler's first business is usually to attract the fish to the place intended for angling. The method of doing this in standing waters, is by throwing in grains, barley, boiled bread, worms, and the like. In running rivers a tin box is introduced, bored with holes, with a plummet to sink it, and a line to draw it back at pleasure, which is to be thrown into the water in a proper place, above which the angler may stand under cover. The worms will slowly and gradually crawl out of this box and is a great inducement to the fish to hover about the spot to feed upon them. If this method does not bring the fish about the place in a short time, there is reason to suspect that the presence of some pike lurking thereabout deters them from approaching. In this case the angler should throw out a baited hook, by which he will generally be taken. The angler may then take his stand under the shelter of some tree or bush so that he will just discern his float, as the fish are easily frightened away. When pastes are used, it is proper to use a little tow with them to keep them firm, and rub them over with a little honey, and a subsequent anointing with butter will tend materially to prevent their being washed off the hook. The usual way of angling with the fly is down the river and not up. In angling for trout, half a dozen trials in one place is sufficient to ascertain whether the fish will stir and take the bait. In a pond the best place to angle is where the cattle go into the water. In rivers, breams are usually obtained in the deepest and quietest places. Eels are found under overhanging banks. Perch frequent clear places, where the stream is swift; chub in deep shaded holes; roach in the same places as perch; and trout in only swift and clear streams. In places where there are many weeds, or old stumps of trees, fish harbour in great numbers; in such situations there is much danger of entangling the line, attention should therefore be paid to the hook to keep it clear of the weeds, and when the accident does happen, recourse is to be had to a ring of lead about two inches diameter which is to be fastened to a packthread; this ring is to be passed over the rod and let to fall in the water where the hook is entangled; then by pulling the packthread gently the

hook will be disengaged, or at the worst broken off near the end of the line, probably thereby avoiding the loss of the whole line, or the breaking of the rod itself. Deep waters are generally found to be the best for angling, the surface not being much disturbed by the weather, a slight ripple is however desirable. The opening of sluices and mill-dams always bring fish up the current to seek for the food which is usually brought with the stream; angling in such places, therefore, usually proves successful.

The best season for angling is from April to October; the best time of the day from three till nine in the morning, and from three till sunset in the evening. Easterly winds are usually unfavourable to the angler, and the southerly are the best; a warm but lowering day is most of all to be chosen, but much heat as well as cold are alike unpropitious to the sport. It has been noticed that the fish bite very freely on a cloudy day, after a bright moon-light night.

An excellent mode of judging what bait is likely to allure any particular kind of fish, is, when one is caught, to open it, and examine the stomach, and whatever is found there, will surely be the proper bait for others.

The mode of catching other kinds of fish than those mentioned will be given under the article FISHING.

ANGULAR MOTION, in mechanics and astronomy, is the motion of a body that describes an angle, or which moves circularly round a point. Thus, a pendulum has an angular motion about its centre of motion, and the planets have an angular motion round the sun.

Angular motion is also a kind of motion composed of a right-lined and circular motion, or in which the moveable body slides and revolves at the same time; such is the motion of the wheel of a coach, or other vehicle.

ANIL; the name of the plant, from the leaves of which indigo is prepared in America.

ANIMAL SUBSTANCES comprehend whatever form the component parts of animals; these, as far as they have been analysed, may be arranged under the following heads: viz. gelatine, albumen, mucilage, fibrin, urea, sugar, oils, resins, acids, alkalies, earths, metals; and these are found to consist chiefly of different modifications of the following principles, viz. azote, carbon, hydrogen, oxygen, phosphurus, sulphur; besides soda, potass, magnesia, silica, and iron.

ANIMALCULE, is a term applied to such animals as are too diminutive for their true figure to be discovered without the help of a magnifying glass. The naked eye takes them in from the elephant to the mite; but the microscope brings to our astonished view real, living, locomotive animals, so minute that the mite is as an elephant in comparison with them, being twenty-seven millions of times smaller. Improvements in the microscope may discover to us an order of beings still smaller, and there are probably others perfectly invisible to us by any aid whatever.

ANIME, commonly, but improperly called gum anime, is a re-

sinous substance, chiefly imported from New Spain and the Brazils. There are, however, two principal sorts, the eastern and the western. The former is dry, of an uncertain colour, some being greenish, some yellowish, and some the colour of myrrh. The latter is in yellowish white, transparent, and somewhat unctuous tears, in large masses, resembling frankincense, of a pleasant taste, easily melting in the fire with an agreeable smell. Like other resins, it is totally soluble in alcohol, and also in oil. Water takes up only one sixteenth of the weight by decoction. The spirit, drawn by distillation, has a considerable degree of the taste and flavour of the resin; and the distilled water discovers on its surface a small portion of essential oil. Both kinds of anime are used in perfumes, as well as in medicine externally, such as plasters supposed to be of service in nervous affections of the head and other parts.

ANINGA, a root which grows on the Caribbee Islands, much used in the refining of sugars; it is found to be much more effectual and a more innocent means of clarification than the sublimate of mercury and arsenic previously used.

(To be continued.)

WHEATSTONE'S PATENT IMPROVEMENTS TO ORGANS, PIANO FORTES, &c.

The patentee (Mr. William Wheatstone, of Jermyn-street, St. James's) proposes to improve and augment the tone of the above-mentioned instruments by the introduction of drums, or similar vibrating surfaces, against which the sounds elicited shall reverberate, and thus augment the tone, and improve the melody. For this purpose wooden frames are fitted to the inside of the instruments, upon which is tightly stretched paper, parchment, vellum, or similar substances, which constitute the drum. These being placed as nearly as possible to the sounding boards of the instruments, are powerfully acted upon by the vibration of the notes given out, and to conduct the sound emitted with greater effect to the ears of the auditory, trumpet shaped apertures are made through the cases of the instruments.

Manufacture of Flint Glass for optical purposes.—The late M. Guinand of the village of Brenet, in canton of Neufchatel, was a celebrated manufacturer of telescope glasses; he surpassed all his competitors in the qualities of clearness and homogeneity. An accident that occurred in the course of his avocation, afforded him an important hint for the improvement of the manufacture, of which he availed himself with great success.

When he first obtained blocks, including portions of good glass, his practice was to separate them, by sawing the blocks into sections that were horizontal, or perpendicular to their axis; then, polishing the sections, he selected those portions which were best adapted to his purpose, and returned the others into the crucible. Independently

of the tediousness and waste of this process, it was attended with the disadvantage of not cutting the finest parts of the glass in the manner best calculated for large disks ; for frequently the most homogenous parts were thus divided. From this difficulty he was however relieved by the above mentioned accident, the nature of which was as follows :

When his men were one day carrying a block of this glass on a hand barrow to a saw-mill, which he had established at the fall of the Doubs, at the distance of half a league from his house, the mass slipped off the barrow, and rolling to the bottom of a steep and rocky declivity, was broken to pieces. M. Guinand was at first grieved at this misfortune, but having selected those fragmeuts which appeared to be perfectly homogenous, he softened them in circular moulds in such a manner that on cooling he obtained disks that were fit for working. To this method he adhered ; and he contrived a plan of cleaving his glass while cooling, so that the fractures should follow the most faulty parts. When flaws occurred in the large masses, he removed them by cleaving the pieces with wedges, he then melted them again in moulds, which gave them the form of disks, taking care to allow a little of the glass to project beyond one of the points of the edge, so that the optician might be enabled to use that portion of glass in making a prism, which would give him the measure of the index of refraction, and thus obviate the necessity of cutting the lens. The refraction of M. Guinand's glass varies at almost every casting, while, on the other hand, that of each casting is of such homogeneity, that the refractive force of two pieces taken indifferently, one from the top and the other from the bottom of the crucible, is absolutely the same.

The defects M. Guinand removed by the wheel ; then by resoftening the disks, the vitreous matter expanded and filled up the hollows that had been made. If after polishing he found the disks still defective, he repeated the process until the disks were perfect. By these means he often succeeded in soldering pieces of glass, which left no trace of their previous separation. At first, when he only *cemented* these pieces, there were frequently air or even sand between the united surfaces ; in these cases he cut along the line of junction, a small semi-cylindrical groove, in order that the vitreous matter, while melting might fill it, not by flowing from its edge to the bottom, but by raising the bottom itself ; and by repeating this operation, he succeeded in totally effacing all traces of junction.

LETTERS OF INQUIRY.

From T. R.—What is the nature of the composition used by rat-catchers to attract the rats ?

What quantity of alum should be put into a gallon of beer to clear it ? *

* Ten grains, or less, would probably be sufficient ; avoid using more than necessary.—Ed.

From H. S.—The writer is desirous of seeing in the Register an account of Mr. Annesley's Boring Apparatus; also a further description of Dr. Church's New Boring Instrument.

Both these implements possessing great merit, we shall make it our business to give a description of them in an early number; in the mean time we shall be obliged by any information respecting the latter invention.

RECENT PATENTS.

PAVING OF ROADS.—To Thomas Parker, of Bache's-row, City-road, for a new-invented mode of paving parts of public roads. 29th March. 6 months.

WATER-ENGINES.—To Rudolph Cabanal, of Melina-place, Westminster-road, for improvements in machinery for raising water, &c. 30th March. 6 months.

FIGURED STUFFS.—To John Heathcoat, of Tiverton, Devon, for a new and improved method of figuring or ornamenting various drscriptions of goods manufactured from silk, cotton, flax, &c. 31st March. 6 months.

RAILWAY.—To Jacob Jeddery Fisher, Esq. of Ealing, Middlesex, for his new-invented application of railways and the machinery to be employed thereon. 2d April. 6 months.

AIR AND GAS ENGINE.—To Simeon Broadmeadow, of Abergavenny for an apparatus for exhausting, condensing, or propelling air, smoke, gas, or other aireformed products. 2d April. 6 months.

HORSE-COLLARS.—To William Turner, of Winslow, Chester, and William Mosedale, of Park-street, Grosvenor-square, for improvements on collars for draught horses. 2d April. 2 months.

RAILWAYS.—To R. W. Brandling, Esq. of Low Gosworth, near Newcastle-upon-Tyne, for improvements in the construction of rail roads and on the construction of carriages to be employed thereon and elsewhere. 12th April—6 months.

HYDRAULIC MACHINERY.—To Wm. Shalders, of Norwich, for his new-invented gravitating expressing fountain, for raising or conveying water or other fluids. 12th April.—2 months.

GENERATING STEAM,—To William Gillman, of Whitechapel-road, engineer, and James William Sowerby, of Birchin-lane, merchant, for certain improvements in generating steam, and on engines to be worked by steam, or other elastic fluids. 13th April.—6 months.

FUEL.—To Thomas Sunderland, Esq. of Croom's-hill, Blackheath, Kent, for a new combination of fuel. 20th April.—6 months.

STORING GAS.—To Charles Ogilvy, Esq. of Verulam-buildings, Gray's-inn, for a new apparatus for storing gas. 20th April.—6 months.

PROPELLING VESSELS.—To John Broomfield, of Birmingham, and Joseph Luckock, of Edgebaston, near Birmingham, for improvements in machinery for propelling vessels. 20th April.—6 months.

BLEACHING.—To W. Wright, of Wellclose-square, London, for improvements in machinery, for washing, cleansing, or bleaching linens, cottons, and other fabrics. 20th April.—6 months.

TO READERS AND CORRESPONDENTS.

We are requested to correct the following errors of the press.—In "answer to I. H. H." No. 40, p. 253, for "identified" read *identical*; and in the following line for "is connected" read *as* connected. In Mr. Russell's letter, No. 42, p. 284, instead of "much less," read *except*; and for "emoluments," read *emolument* in the singular number.

We thank H. G. for his very interesting paper, but the subject of it does not come within the scope of the REGISTER.

H. H.—A Mechanic.—W. S.—T. Haynes.—and W. B. are received.

W. R———e will receive an answer upon application to the Publisher.

We have not yet received any explanation from Edward Jenneson.

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REGISTER

OF

THE ARTS AND SCIENCES.

No. 45.] SATURDAY, JUNE 4, 1825. [Price 3*d*.

CONTENTS:

Gordon's patent LocomotiveCoach322
Burt's Patent Cranks..... 324
Vallance's method of Conveyance 325
Clark's Quicksilver Pump 328
Gosset's patent wire gauze articles 329
Turner's patent Crimping Apparatus..... 330
Encyclopædia of the useful Arts 331
Mr. Gladwell's Plane..... 334
Miscellaneous.—Instantaneous light, 334,—To make the Chemical Fire-boxes, 335,—To make SodaWater, ib.—To make indelibleMarking-ink ib.—To make Indian Ink, ib.—To make Opodeldoc, ib.—To make Nankeen Dye, ib.—Discovery of a New Comet, ib.—Comparative Magnitude of the Planets, ib,—Queries in the Arts, ib.....
List of Patents, Correspondence, 336

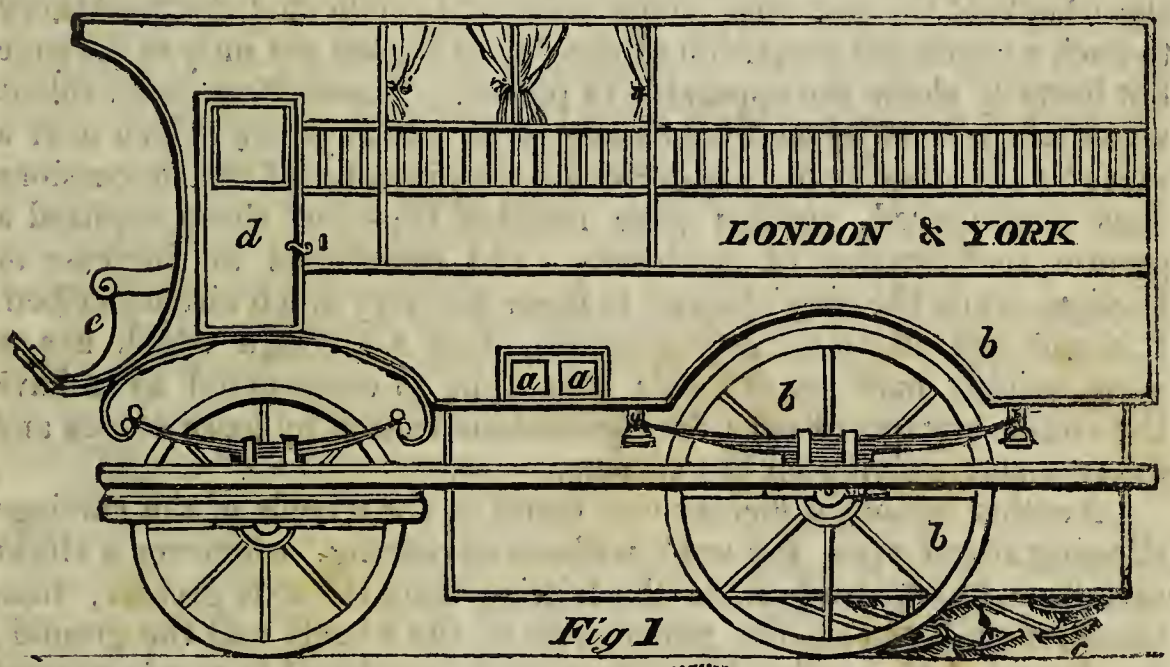


Fig 1

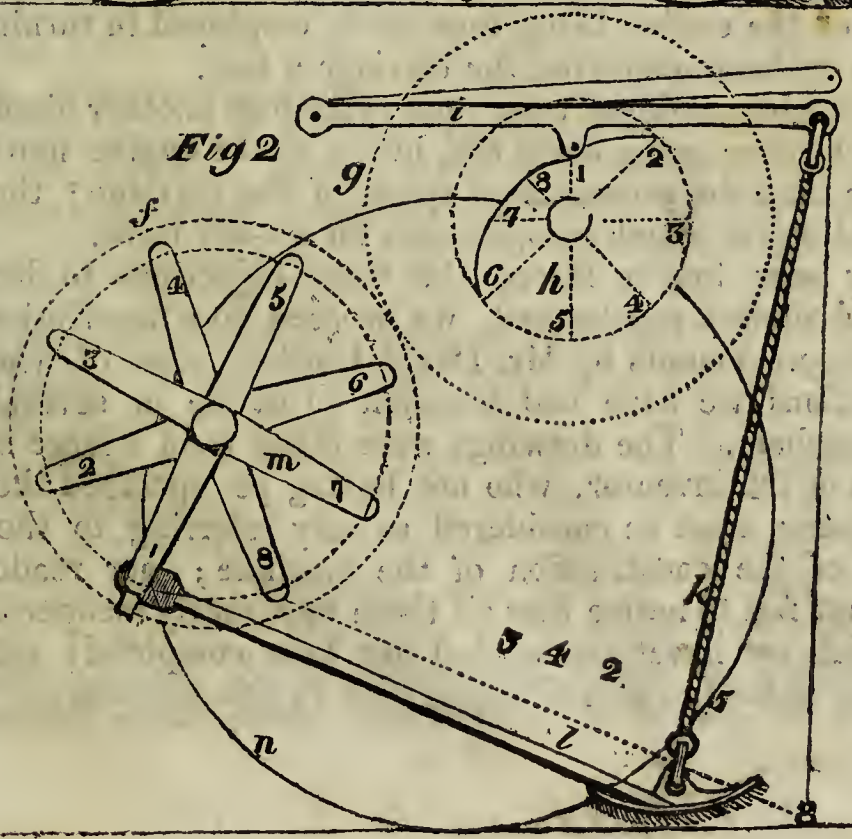


Fig 2

MR. DAVID GORDON'S PATENT LOCOMOTIVE COACH.

MR. DAVID GORDON'S PATENT LOCOMOTIVE CARRIAGE.

There are, we believe, few engineers of eminence of the present day, who have not devoted much of their attention and study to the discovery of the best method of constructing a locomotive carriage, that could be advantageously employed upon the common roads. To persons having but a smattering in mechanical subjects, the matter has appeared of easy attainment, as the obstacles with which it is beset do not appear at the first glance. We need not wonder therefore at the numerous models of locomotive carriages that have been consigned to the nursery as companions to the rocking-horse, when so many men of real genius, with the advantage of a scientific education, should have totally failed in bringing forth any thing that could at all compete with our ordinary modes of conveyance. The failure of many of the attempts have been mainly owing to the circumstance of the moving power having been applied by cog wheels or cranks to the wheels of the carriage, which necessarily subjected the machinery to such a continued repetition of shocks, as tended not only to derange but literally shake the apparatus to pieces. These effects are evident when the present locomotive carriages on railways are driven over a piece of gravelled road. To overcome the difficulty of the concussions thus experienced, springs were resorted to;—but these required a greater complication of machinery, and occasioned an increase of friction, while the play allowed to them was very much circumscribed. It seems indeed to be indispensable, that a carriage which has to move quickly over rough roads should be so constructed as to have the engine preserved from the concussions caused by loose stones and other obstacles lying on the surface.

Another serious difficulty was found in the wheels of the carriage slipping round upon the road without advancing, whenever a slight ascent or heavy load made the friction upon the axis greater, than the friction between the peripheries of the wheels and the ground; the power of the engine being thus solely employed in turning round the wheels without advancing the carriage a foot.

In locomotive carriages upon such principles another disadvantage is sustained when going *down hill,* owing to the engine moving at a slower rate than the accumulated speed of the carriage; thus losing that natural power which compensates for *up-hill* work.

Having now briefly stated the main objections to locomotive carriages heretofore constructed, we proceed to a description of the patented improvements by Mr. David Gordon, some of whose masterly inventions we have had occasion to notice in several of our previous numbers. The drawings were taken from a large model by permission of the inventor, who not having yet specified the patent, our description must be considered as only referring to the general principles of the construction of the machine; our readers will, however, not fail to notice that all those apparently insuperable difficulties which we have enumerated are here completely got rid of, they having in fact no sort of application to this machine.

The body of the carriage in which the engine and propelling machinery are placed, is hung upon one of Mr. Gordon's Patent three-wheeled Carriages, the advantages resulting from which have been fully described in our account of that invention in the 27th No. of this Work. As applied to locomotion, the great saving of friction and the peculiar facility of guiding by means of the front wheel are benefits of the highest importance. To these favourable circumstances may likewise be added the large space for the situation of the machinery in the most desirable part of the vehicle.

The engine and other machinery rest upon the light and easy springs of the carriage, and the wheels cannot slip round without advancing the carriage, their motion being produced solely by the friction of the feet of the propellers upon the ground, which by their pressure force the carriage forward.

The difficulty of going down a hill is likewise entirely avoided, by the propellers being lifted off the ground at pleasure, which allows the carriage to proceed without interruption by its own gravity; while it admits of the most simple means of arresting or retarding its progress at will, by the application of the friction band by the guide or engineer. For this purpose a line passing over a pulley or roller is employed, so that all the propellers may be taken off the ground at once, by the guide pulling the cords, which operation alone gradually stops the machine when upon a level, and quickly if it be ascending an inclined plane.

By this contrivance another formidable difficulty, that of *making a turn* in the road is at once overcome, simply by taking the propellers off the ground on the side that the carriage has to turn, by a pull at the cord.

In the body of the carriage and connected with the piston rod of the engine is a 6, 8, or 10 throw crank (8 represented in the drawing) each crank being equidistant. By the revolution of these cranks, a like number of rods, called propellers by the patentee, are forced out against the ground in a backward direction. These rods are hollow iron tubes filled with wood, thus combining lightness with great strength. To the ends of each of these propellers are attached what may be here considered a substitute for a horse's foot, although their form is very different, being a segment of the eighth part of a circle of the same size as that described by the cranks. They press against the ground by a rolling sort of motion, causing a sufficient adhesion to the surface, without either slipping or digging it up, and adapt themselves to any slight turn of the carriage. The under part of these feet are formed of cork, short hair, wire, whalebone, or any other stiff and elastic material, placed endways, and supported by iron teeth which would take effect in the event of the packing failing.

These propellers after performing their office on the ground for the eighth part of a circle are suddenly raised from it by a series of eccentrics on the same spindle, and held in readiness for the time when their respective cranks shall arrive at the situation to have the operation repeated. By this continuous series of propellers which includes the whole circle described by the crank, our readers will

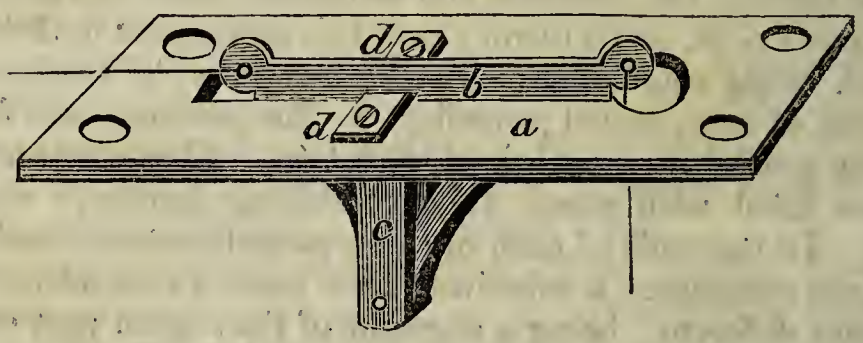
observe that a great gain is obtained over the parallel motion in Mr. Brunton's locomotive carriage.

In countries where sledges are used for travelling over snow, the machine may be placed upon skates, and the feet of the propellers be shod with suitable iron teeth.

Reference to Engraving.—*Fig.* 1. gives the appearance of the loco-motive carriage, which in this instance would be to carry sixteen passengers with guide and engineer, and also a large quantity of luggage or goods. *a a* the windows into the engine room. *b b b* the situation of the propelling machinery. *c* the guide's seat who will guide the carriage by the common method of wheel and pinion on the front wheel.

Fig. 2. will give an idea of the machinery. *m* an 8 throw crank of wrought iron which is connected with the engine describing the circle 8, 6, 4, 2, and in its revolution projecting *l*, the propeller, which as they cannot slip upon the ground force the carriage forward. *f g*, teethed wheels to work the eccentric wheels, *h*, which are made to regulate the operations of each propeller, so as to move them in corresponding spaces, 8, 7, 6, 5, 4, 3, 2, in succession. *k* a slight iron rod to connect the levers and eccentrics at *i* and *h* with the propellers.

Upon the whole, the plan appears to us admirably adapted for general use on the public roads; and that nothing appears wanting to introduce it generally, but the construction of light engines which the ingenuity and spirit of the age will no doubt soon supply; and it is not improbable that in the course of time the plough and the harrow will become subjects for the exercise of its power.



BURT'S PATENT IMPROVED CRANKS AND BELL PULLS.

The cranks in common use for the hanging of bells move upon an axle or pin which is firmly rivetted on a bar connected with the plate, which plate is screwed upon the wall or wainscot of the room. The consequences of this mode of construction have been found to be very inconvenient, for in order to repair the wire or otherwise regulate them, the workmen have been hitherto under the necessity of taking down the cranks, causing thereby damage and disfigurement to the stucco or papering.

To remedy these very obvious defects in the present construction of cranks, Mr. Henry Burt, ironmonger, of Devizes, Wilts, has taken

out a patent for some very simple yet nevertheless valuable improvements to them, consisting merely in several different modes of attaching the cranks to the crank-plates by means of screws placed exteriorly, so that they may be removed and replaced without injury to the walls, cornices, painting, or papering of the room. We shall now describe several of the methods adopted in the principal sorts of cranks.

That kind of cranks, called *mortise cranks*, (of which there is a great variety adapted to their peculiar situation and the number of wires they carry) we have selected to shew the improvement, and attached to one of the simplest form, as exhibited in the above figure. *a* is the plate screwed to the wall, *b* is the crank turning upon its axis in the standard *c;* which standard is not fixed or cast to the plate but merely screwed to its upper surface by means of the two lips *d d.* In order to pass the crank in and out of the plate, notches are cut in it cross-ways of the slot sufficient to allow of its removal.

To apply the same principle to a plate *purchase crank,* (which is that kind with a long crane-necked lever, usually employed for attaching the bell ropes over a fire-place) it is merely to fix the crank to a small plate in the first instance, and then screwing the small plate to the larger, or ordinary one, which will of course allow of its being removed at pleasure.

In bell pulls of the lever kind, the axle or fulcrum instead of being rivetted, is screwed, and may consequently be removed and replaced without disturbing the other part. In concave bell-pulls, commonly fixed in outside door-posts, the square socket in which the short bar slides is screwed to the interior concave part immediately contiguous.

MR. VALLANCE'S METHOD FOR THE CONVEYANCE OF PERSONS AND GOODS.

In our 18th and 19th Numbers we gave an account of Mr. Vallance's grand (and we confidently believe *practicable*) scheme for travelling in a cylinder, by affecting a partial vacuum at one end of it. The subject was by us rather improperly headed "Travelling in Vacuo," which we think has been in some measure the cause of the misconception of many persons who did not read the subject itself, for we are satisfied that nothing is therein stated to countenance the notions entertained by two of our correspondents ("J. S." and "Common Sense,") who have written to us long commentaries on the assumed absurdity of the plan; upon the impossibility of breathing or existing in a vacuum, or of sustaining such rapidity of motion as has been contemplated; upon the impracticability of rendering the joints of such vast apparatus air-tight &c. With respect to the first of these objections, it has never been proposed that persons travelling in the cylinder should be exposed to, or breathe any other than the common air. On this point Mr. Vallance distinctly says, "The degree to which air would be exhausted from the cylinder, might never be sufficient to sink a barometer two inches lower than one exposed to the atmosphere stood at; so that even

were we exposed to it, no inconvenience would be felt. But we never shall be exposed to it, any more than those who witness the cruel experiment of putting a mouse under the receiver of an air-pump, and then exhausting it, are exposed to what the little animal suffers. Between those who *see*, and the poor creature which *feels* the effect of the apparatus, is the side of the receiver. And between the part of the cylinder in which the exhaustion, or rather the difference of density is, and the passengers in the vehicle, would be the *end* of the vehicle; so that though *close to them*, would be an atmosphere rarer than (we will suppose) it might prove pleasant to be in; yet would the atmosphere *they actually were in*, be the same as that of the air at large."

Anticipating this and other popular objections, Mr. Vallance, in the work before us,* has fairly met and answered them all. With respect to the *rate of motion*, he observes:—

"Without adverting to the speed at which the riders of our race-horses sometimes go *through* the air, the experience of our aëronauts is conclusive in this particular. Much as they have sometimes been inconvenienced from the rarity of the air, at the height to which they have ascended, yet, never have we heard them complain of being unable to breathe freely owing to the velocity with which they were blown † along. And why? because that which was the cause of motion went with them. Rapidly, therefore, as they moved, yet did they feel in a calm. Now exactly similar to this will be the feeling of those who might be conveyed in the cylinder. The air, being the cause of the motion, must go at least equally fast as it drove them, and necessarily be wherever they were. Let the rate of motion, therefore, be what it might, the feeling of those who experienced it must prove that of being in a perfect calm.

"We may be satisfied then, that no velocity we can in this way attain, will prove more inconvenient than our present modes of travelling. If, however, it should, we can immediately remove the inconvenience; and that by the simplest process,—namely, going slower—the power of doing which, will be in our hands to any extent we choose to exercise it; whether to that of reducing the rate of motion to ten miles, or even to one mile an hour.

"With, therefore, the ability of causing ourselves to be conveyed at whatever rate we please, between the slowest at which it is possible to move, and the greatest we can exist under, entirely at command, the objections which at first strike us as fatal to the proposition, have, in fact, no application to it.

"The regulation of the rate of motion, also, we shall find to be much more in our power, than it can at first be conceived it will prove. Instead of being, as it at first strikes us we *must* be, at the mercy of those who would direct the operation of the exhausting appa-

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* Entitled "Facility of Intercourse," published by George Wightman, 46, Fleet Street.

† Mr. Garnerin travelled in a Balloon from Ranelagh Gardens to Colchester in 45 minutes, being at the rate of 80 miles per hour.—Ed.

ratus at the end of the cylinder, and liable to be either hurried along with a velocity that might prove fatal, or left to creep like a tortoise in his hole, we should find ourselves in a situation, which, with reference to the mere ability of moving, would prove more analagous to that of a ship in a stiff breeze, than any thing else it can be compared to.

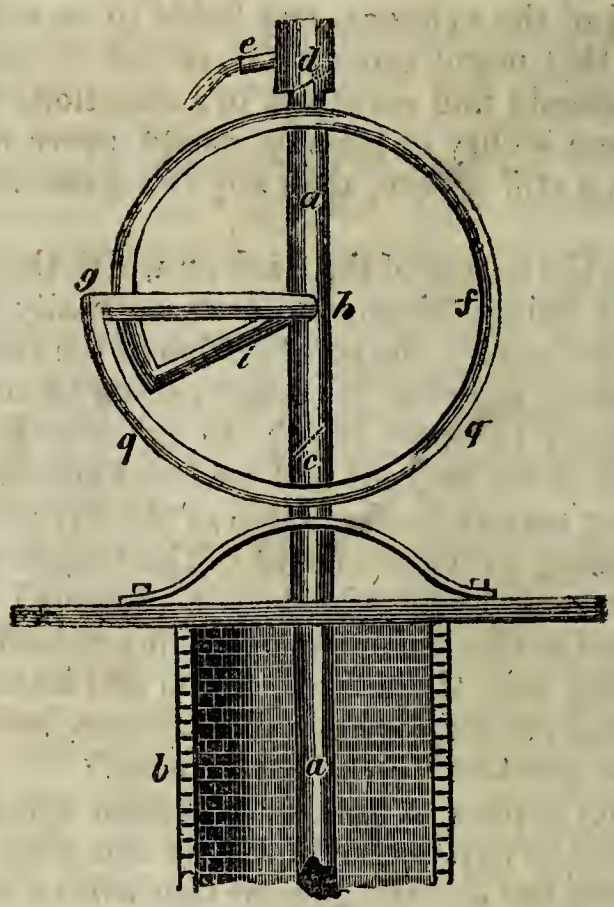
"For, while the nature of the track on which the vehicle would run will admit of its being driven, at least, as easily as a ship can be moved through the water; the construction of the vehicle itself would be such as to admit, either of its being caused to stop and remain at any particular spot, in a way which, in point of fact, may be compared to a vessel being stopped and rendered stationary by laying to, or of its exposing surface to the action of the air, and being moved at a rate corresponding with the amount of the surface so exposed, (and which can be increased or diminished at pleasure) as the way of a vessel is increased or diminished by spreading or taking in sail. With the power of doing this, the rate of motion will be so entirely at command, that we may render it whatever we please, between the slowest possible, and the greatest we can exist under.*

"This ability replies to another objection which at first appears serious; and gives us to perceive that if we can stop, when and where we please, it needs but an arrangement that will be easy of execution, to admit of taking up, and setting down passengers and goods, at every place the course of the cylinder may pass through; in the same way that coaches take up, or set down.

"It will be seen, that if we can exhaust with the rapidity that has been stated, a leak or two in the cylinder would be of no consequence. Neither will the air that may pass the vehicle be of importance. Were a space of even an inch in width left between the vehicle and cylinder, arrangements might be made, which would prevent air passing between them, to a degree sufficient to counteract the operation of the principle. How much more easy will this prove, when the cylinder and vehicle may be so adapted to each other, that a space greater than the tenth of an inch shall not be left between them. And even this space may be so dealt with, as almost totally to prevent leakage under the trivial pressure which has been mentioned; and that too without occasioning perceptible friction."

The principal objections to the plan are thus ably replied to by the Inventor himself, as far as our limits will permit.

* Communications will always take place between the ends of the cylinder immediately prior to a vehicle being sent off, and as soon as it arrives. How this will be done cannot be explained here; but in the proper place it will be shewn, that a method of communication independent of itself, will exist between the ends of the cylinder: that this method will be instantaneous: and that those who direct operations at either end can inform their fellows at the other of any circumstance it may be necessary to communicate; such as, that they want the exhausting apparatus stopped—that they want it set going again—that an extra vehicle is about to be sent off,—that the night's load of goods will be a very heavy, or very light one, &c. An account of this method of instantaneous transmission is given in the 41st and 42nd Nos. of the Register.



CLARK'S QUICKSILVER PUMP.

" To the Editor of the Register of the Arts and Sciences, &c.

" Sir,

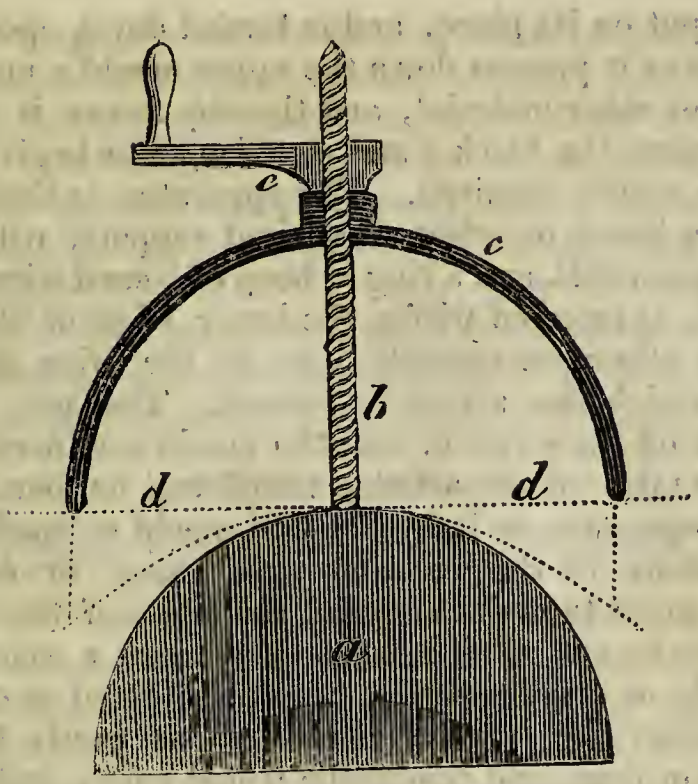
" An hydraulic machine has been invented by Mr. Thomas Clark, of this city, which seems to possess so much novelty, as well as simplicity and effectiveness, that I have thought a description of it not unsuited for insertion in your useful work, and I accordingly send it to you for that purpose.

a a is the main pipe inserted into the well *b*; a valve is situated at *c*, and another at *d*, both opening upwards; a piece of iron tube is then bent into a circular form, as at *f*, again turned off at *g* in an angular direction, so as to pass through a stuffing box at *h*, and from thence bent outwards as at *i*, connecting itself with the ring. A quantity of quicksilver is then put into the ring filling it from *q* to *q*, and the ring being made to vibrate upon its axis *h*, a vacuum is effected in the main pipe by the recession of the mercury from *g* to *i*, thereby causing the water to rise and fill the vacuum; upon the motion being reversed, the quicksilver slides back to *g*, forces up the water and expels it at the spout *e*.

" Mr. Clark calculates that a pump of this description with a ring twelve feet in diameter, will raise water the same height as the common lifting pump, and force it one hundred and fifty feet higher without any friction.

" *Edinburgh,* " Yours, &c.

" *May* 21, 1825. " I. R——N."



GOSSET'S PATENT WIRE GAUZE BASKETS, DISH COVERS, &c.

These new and elegant articles of manufacture having become of almost popular attraction, on account of their usefulness as well as beauty, we conceive that a short account of the method by which they are produced cannot be otherwise than interesting to those of our readers who are unacquainted with the process. It is a foreign invention, and the patent right for this country is possessed by Mr. Gosset, of Queen-street, Haymarket.

The operation is exceedingly simple, being performed entirely by forcing the wire gauze between moulds of the required shape by the power of a screw press, which causes the figure or pattern thus given to it to be permanently retained after the article has been withdrawn from the mould. We extract the following from the specification before us :

"It consists of a pattern or block, *a*, of metal, wood, or other suitable material, which is formed on the exterior surface to the desired shape and size of the article intended to be produced. The block *a* has a screw *b*, projecting up from the top or crown thereof; *c* represents a pattern or mould made in like manner, of any suitable material; the interior surface of this mould is formed to the desired shape of the article intended to be produced, and has an aperture made in the crown thereof, so as to be capable of passing over the screw *b*, and thus permit the mould *c* to come down over the block *a*, as shewn in the figure.

"The manner of using the machine is as follows : the metallic wire gauze or other material (which is intended to be shaped), has a hole made through it, and is passed over the screw *b*, so as to rest upon the crown of the block *a*, as seen at *d d*. In this situation the upper mould *b* is placed upon the said metal or gauze wire, with the screw passing through its aperture, as aforesaid; and the nut or

handle *c*, is put on its place, and is turned down upon the screw *b*, by which means it presses down the upper mould *c* upon the metallic wire gauze, or other material, and thereby forces it into the cavity or space between the block *a* and mould *c*, so as to give it the desired shape of the article required. The apparatus is then inverted and placed upon a bench or other convenient support, with the screw *b* projecting downwards, and a ring or hoop of tinned wire, or other suitable material, is inserted within the lower edge of the article, and is soldered or otherwise securely fixed to the wire gauze, or other material, of which the article is formed. The nut *e* may then be screwed back off the screw *b*, and the mould and block may be separated so as to take out the article, which will be found to retain the pattern or shape given to it by the said mould or machinery. After this the portions of the metallic wire gauze, or other material, which may happen to project beyond the edges of the aforesaid hoop or ring, are to be cut off all round evenly, and a small ornamental band of metal, or other material, may be soldered or otherwise fixed upon the exterior edge of the article, so as partly to conceal the interior hoop or ring, and render the whole neat; and then to finish and complete it, a small nut or button may be fixed through the aperture in the crown, for the convenience of carrying the articles by. Articles of this description will be found very serviceable for covering up delicate commodities or articles of food, to preserve them from the effects of flies, and for a great variety of useful purposes."

The specification then proceeds to describe another slight variation from the above method, for "producing articles of such a description will not admit of a hole or aperture being made in them." For this purpose the actuating screw is made to pass through a fixed nut in an iron frame, the end of the screw entering the flat or lower side of the block, which is forced into the cavity of the mould with the wire gauze between them. The patentee concludes by claiming as his invention, "the forming or producing of articles of various shapes, patterns, and sizes, out of metallic wire gauze, or other materials, as aforesaid, by the operation of pressing or forcing the said metallic wire gauze, or other material, into moulds or shapes of the desired form of the article intended to be produced. The articles so formed or produced from the metallic wire gauze, or other material, being caused to retain or preserve the shape or pattern which may have been given to them, by means of one or more hoops or rings, which are secured by solder or otherwise to the edges of the said articles during the time they remain within the mould."

TURNER'S PATENT CRIMPING APPARATUS.

This patent is for making of metal the grooved blocks and rollers heretofore made of wood; and commonly used for the purpose of crimping or plaiting of linen, previous to the recent introduction of those machines for the same purpose which consist of a pair of fluted metallic cylinders.

Instead however of a *solid* block, like those of wood, the patentee makes it of iron or brass, and hollow as a square box, for the reception of an iron heater. The roller is also of metal with indentations corresponding with the grooved face or upper surface of the box, and is mounted upon a carriage in which it turns upon its axis. As usual in ironing, the linen or muslin in a damped state is laid upon the heated grooved surface of the block, and the roller passed over it, by which the indentation or crimping is instantly effected, and with much greater permanence than when the operation is conducted without the aid of heat, as in the wooden blocks before mentioned.

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. X.—*(Continued from page 318).*

ANKER, a liquid measure, chiefly used at Amsterdam. It is the fourth part of the awm, and contains two stekens; each steken consists of sixteen mengles; the mengle being equal to two of our wine quarts. The English anker measure contains thirty-two gallons.

ANNEALING is the process by which metallic and vitreous bodies are reduced from a brittle to a more flexible state. In the manufacture of glass, the articles whilst hot are placed in a kind of oven or apartment called the leer, where they are suffered to cool very gradually, in a greater or less time according to their size and thickness. The difference between annealed and unannealed glass, with respect to brittleness is very remarkable. When a vessel of unannealed glass is broken, it often flies into a small powder, with a violence seemingly very unproportioned to the concussion it has received. This effect is remarkably exemplified in the little glass bubbles sold in the streets, and called Prince Rupert's drops; which are drops of common bottle glass, that fall from the rods on which bottles are made into water which suddenly cools them.

Glass is one of those bodies which increase in bulk as they pass from the fluid to the solid state. When it is allowed to crystallize regularly by gradual cooling, the particles assume a fibrous arrangement, and it acquires so much elasticity as to be susceptible of long continued vibrations; but when a solid mass of melted glass is suddenly exposed to the cold, the surface crystallizes and forms a compact shell round the interior fluid parts, preventing them from expanding as they solidify. The particles are thus compressed together with little mutual cohesion, and press outward against the external crust to obtain more space. In consequence of this effort of expansion by the internal parts, most of the glass drops burst in cooling, and those which remain whole are found irregularly crystallized. By the process of annealing the glass is kept for some time in a state approaching to fluidity; the heat increases the bulk of the crystallized part, and renders it so soft that the internal parts have the opportunity of expanding and forming a regular crystallization.

The annealing of metals is also a very important process; most of them possess the singular property of becoming hard and brittle

by sudden cooling after being heated, and the same effect is produced by a long continued hammering upon them. The annealing of the metals is conducted on a similar principle to that of glass by slow cooling. Copper and gold are so much affected by hammering, that they soon begin to crack and split, instead of being extended, which renders it necessary for them to be frequently annealed during that operation.

Vessels of cast iron are annealed to render them less brittle, and many articles are so much softened by the process as to become malleable; and upon the same principle on the large scale, cast iron is annealed, then subjected to the blows of a large hammer moved by mechanical power, which converts it into wrought or forged iron.

In some manufactories the following method is adopted for softening cast iron. Two parts of quick lime and one of fine clay are mixed with water to the consistence of a thick paste. This mixture is spread over the iron to be softened about a quarter of an inch thick for large pieces, and thinner for small pieces. The iron thus prepared is put into an iron box, made air tight by luting the joints, then placed in a furnace and heated to a cherry red; it is then covered with hot ashes and left to cool; by this method cast iron may be rendered very malleable, and even softer than common wrought iron. The same process is adopted in Mr. Dickenson's manufactory for iron buoys, &c. in the Borough (of Southwark), for softening common wrought iron rivets, by which they are rendered so extremely ductile as to be even preferable, and more to be depended on, than those made out of the best quality of iron.

ANNATTO (otherwise denominated *Arnatto, Arnate, Attole, Orlean* and *Rouco)* is a red fecula employed as a dye, brought from the West Indies, South America, and very lately from the East Indies.

It is procured from the pulp of the seed capsules of a shrub called by the natives *o rouco*, which is the *bixa orelana* of Linnæus. The plant grows usually seven or eight feet high, but in some situations rises to twenty feet, producing oblong hairy pods, somewhat resembling those of a chesnut. Within each of these are thirty or forty irregularly shaped seeds, which are enveloped in a pulp of a bright red colour, and of an unpleasant odour. The Indians used it as a paint, in the same manner as wood was employed by the ancient Britons. The seeds, together with the red tough matter that surrounds them, are bruised, then softened in a trough with water, which brings on a fermentation, attended with an extremely nauseous smell, and assists in the separation of the kernels, the colouring matter becoming suspended in the water. The mass is then strained through a sieve, and boiled, which causes the fecula to coagulate and form a thick scum on the surface of the liquor. This scum is the pigment, which being taken off is inspissated to a due consistency in another vessel; and when cool it is moulded into roundish lumps, wrapt up in the leaves of trees for exportation, and thus forming what is termed in commerce flag annatto. The French thoroughly dry their annatto before packing it up; but that which is imported

from the Spanish settlements to this country being packed in rather a moist state, soon passes into a putrefactive state, which renders it extremely offensive to the smell.

The annatto commonly met with among us is moderately hard, of a brown colour on the outside and a dull red within. It is but very slightly acted upon by water, tinging the liquor only of a pale brownish-yellow colour. In rectified spirit of wine it very readily dissolves, and communicates a high orange or yellowish-red. Hence it is used as an ingredient in varnishes, for giving more or less of an orange cast to the simple yellows. Alkaline salts render it perfectly soluble in boiling water without altering its colour. It is employed in the colouring of cheese, particularly the Gloucester kind. Its chief use is, however, in the dying of wool and silk.

The East Indian annatto has only very lately been imported into this country, and in small quantity, by the house of Cruttenden, M'Killoch, and Co. of London and Calcutta. It was prepared by Messrs. C. Stewart and Co. lac-dye merchants, in the Bancoorah district, Bengal, and brought to this country for the purpose of ascertaining the opinion of the silk dyers of London as to its value. Samples were also sent to the Society of Arts, who caused some experiments to be made with it by several of the principal silk-dyers of the metropolis, an account of which is given in the last volume of the Transactions of the society (pages 41 and 42); and as the subject is one of no little importance to our manufacturers, we shall here add the following extracts from that Report:

"The East Indian annatto is said to be prepared from the pulp of the seed capsules of a plant, the *metella tinctoria*, which grows wild in the neighbourhood of Seevendroog, and in other parts of India. The sample sent to the Society is in the form of small thin cakes, perfectly dry, inodorous, and of a deep but dull orange-red colour.

"The first experimeut made under the inspection of the Committee of Chemistry, was at the dye-house of Mr. Reynolds, in Spitalfields. Three of the cakes being ground up with a solution of potash were mixed with a hot solution of soap; the mode of proceeding being the same as that practised by Mr. Reynolds in preparing a vat of Spanish annatto. Skeins of white silk being dipped in this bath took a full orange colour, in the opinion of Mr. Reynolds as bright and perfect in every respect as that given by the best Spanish annatto.

"The next experiment was made at the dye-house of Mr. Jourdaine, in Grub-street. Spanish and East Indian annatto, having each undergone the same previous treatment, were digested in a solution of pearlash in equal proportions, and then diluted with equal quantities of scalding water. Skeins of white silk were then dipped in each; those of the Spanish annatto came out of a full bright aurora, or orange-red colour; those in the East Indian came out of a gold yellow colour. The first bath was almost exhausted, the second seemed quite as rich in colour as before the silk was dipped in it; shewing that, when subjected to Mr. Jourdaine's process, the colouring matter of the East Indian annatto is possessed but of a very feeble attraction for silk. The skeins which had acquired the golden yellow colour

became of a red (somewhat foxy) orange, by being passed through water acidulated with sulphuric acid; but there is an objection to the use of this latter process, as silk so treated is very liable to *scroop*, that is, to be harsh to the feel. The small quantity of East Indian annatto that remained was then put into the hands of Mr. H. Hennell, a member of the Society, by whom the following facts were ascertained. The Spanish annatto, as imported, contains sixty-one per cent. of water. The East Indian contains none. When the two have been brought to an equal state of dryness, alcohol takes up from the East Indian variety sixty-three per cent. of colouring matter, and from the Spanish only fifty-two parts.

"Portions of each variety being dissolved in ammonia, in potash with or without heat, and in a mixture of potash and ammonia, communicated to skeins of silk various tints of colour, from pale gold to full orange red, the superiority being sometimes in favour of one, and sometimes of the other variety."

(To be continued.)

MR. GLADWELL'S PLANE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"MR. EDITOR,

"ALLOW me through the medium of your valuable pages, to make a reply to one that styles himself "A Shipwright," who has undertaken to call in question the principle of Mr. Gladwell's Improved Plane.

"I have *used* the Plane, therefore can speak in positive terms as to its utility; and if Mr. Shipwright did but understand the nature of a dovetail being connected with the wedge of the plane (which at all times has a tendency to secure the iron, and keep the dovetail firm to its position), he would then, from an occular demonstration of the fact, perceive the Plane not so much inclined to chatter as he is.

"I believe Mr. Gladwell has been encouraged by several scientific gentlemen, who have purchased his Plane; among the number stands the name of the Earl of Winchelsea, who has had one sent to his seat in Rutland, which has stamped his invention with dignity at once surpassing all the objections Mr. Shipwright can throw out against it: therefore I think he had much better give more attention to his axe and adze, than trouble himself about joiners' tools, as there are but very few of his calling know the right end of a plane.

"*May* 30, 1825. "A SHIP-JOINER."

[Mr. Gladwell's Plane is probably a very convenient instrument—we do not presume to speak decidedly ourselves; but the opinion of an intelligent shipwright has certainly more weight with us than that of any noble earl *on such a subject.*]—ED.

MISCELLANEOUS INTELLIGENCE.

INSTANTANEOUS LIGHT may be obtained as follows:—Moisten the wick of a candle with spirits of turpentine, put it on a piece of the

oxygenated muriate of potash, touch it with a drop of vitriol, and it will immediately ignite.

To make the Chemical Fire Boxes.—Asbestus is put into a bottle and saturated with oil of vitriol. To make the matches, take oxygenated muriate of potash 1 scruple, lump sugar ½ scruple, golden sulphur of antimony ½ scruple; rub these into a paste in a mortar with a little of the mucilage of gum arabic. Dip the matches in melted sulphur and afterwards tip them with the above paste. Be careful not to rub the above materials when in a dry state, to prevent explosion.

To make Soda-water. Carbonate of soda and tartaric acid in equal quantities. Half a tea spoon full of each in a tumbler of cold water makes a good draught.

To make indelible Marking-Ink.—Take lunar caustic 5 scruples, gum-arabic 5 scruples, sap green 1 scruple, water 1 ounce; put these together in a small bottle which forms the ink. The linen is first wetted with the following preparation:—1 ounce of soda to 2 ounces of water. The marking ink should not be used until the last mentioned preparation has dried on the linen.

To make Indian-ink.—Hold a plate over the flame of a lamp or candle, to obtain the fine soot, which mix with clean size. The Indian-ink of the shops is usually scented with musk.

To make Opodeldoc.—Dissolve soap in alcohol, to which add camphor, and a little of any essential oil.

To make Nankeen Dye.—Boil equal parts of annatto and common potash in water till the whole is dissolved.

New Comet.—M. Gambard, astronomer at Marseilles, discovered a new comet on the 19th ult. It was not until the night of the 27th that the state of the atmosphere allowed it to be seen by the astronomers at Paris. It is near the star Gamma, or Cassiopeia, invisible to the naked eye, without tail or apparent nucleus, having the form of a nebula, which is easily distinguished, notwithstanding the light of the moon.—*Times.*

Comparative Magnitude of the Planets.—Supposing the earth to be 12 inches in diameter, the Herschell is 4 ft. 5 in. Saturn 10 feet, Jupiter 11 ft. 3 in. in diameter. The rest of the planets, which are smaller than the earth, bear the following relative magnitude: Venus 11¾ inches, Mars 6¼ inches, Mercury 4¾ inches, Pallas 3¼ inches, Juno 2¼ inches, Ceres 1½ inches, and Vesta only ⅓ inch in diameter. The comparative diameter of the sun is 111 ft. 8 in. and the moon 3¼ inches.

QUERIES IN THE ARTS.

From "V. C."

"What is the nature of the composition, and the mode of fabricating Parker's Roman Cement?"

From "O. P. Q."

"By what process is soap rendered transparent?"

From "W. R."

"What makes the most economical covering for the roof of a house or other building, durability being considered?"

"What forms the best substitute for white lead paint?"

RECENT PATENTS.

FIRE ARMS.—To A. L. Hunout, of Brewer-street, Golden Square, for certain improvements in artillery, musketry, and other fire arms. 23rd April. 6 months.

PRESERVATION OF VEGETABLES.—To T. A. Roberts, of Monford Place, Kennington Green, for a method of preserving potatoes and other vegetables. 23rd April. 6 months.

COACH-MAKING.—To S. Rider, of Gower Place, Euston Square, for an improvement in carriages, by affixing the pole to the carriage by a newly-invented apparatus. 28th April. 2 months.

INFUSION OF TEA AND COFFEE.—To Daniel Dunn, of King's Row, Pentonville, for an improved apparatus for the purpose of beneficially separating the infusion of tea or coffee from its grounds or dregs. 30th April.—6 months.

WOOLLEN THREAD.—To William Davis, engineer, of Leeds, and of the Vale of Charlnford, Gloucestershire, for certain improvements in machinery, for reducing or converting wool into slivers or threads of any desired length, unlike worsted, presenting more numerous hair points, projecting from the surface of the slivers or threads. 7th May. 6 months.

RAIL-WAYS, &c.—To Thomas Hill, jun. of Ashton-under-Line, for improvements in the construction of rail-ways and tram-roads, and in carriages to be used thereon and on other roads. 10th May. 6 months.

IMPROVED BRICKS.—To Edward Ellis, of Crexton, near Rochester, for an improved brick, or substitute for brick, manufactured from a material hitherto unused for or in the making of bricks. 14th May. 6 months.

COMPOUND WOOD AND METAL RODS.—To Samuel Pratt, of New Bond Street, for an improved manner of combining wood and metal, so as to form rails or rods, adapted to the manufacture of bedsteads, cornices, &c. where strength and lightness are desirable, which he denominates union or compound rods. 14th May. 6 months.

STEAM-ENGINES.—To J. C. C. Raddatz, of Salisbury Square, Fleet Street, for certain improvements in steam engines. 14th May. 6 months.

TO READERS AND CORRESPONDENTS.

If J. S. will call at the publisher's on Tuesday next between 2 and 3 o'clock to explain certain parts of the sketch, the matter may be arranged for publication.

Extract of Mimosa Bark.—The gentleman who has written to us on this subject is informed that he may probably *see* a specimen at the House of the Society of Arts, in the Adelphi; or obtain one, by application to Mr. Brewin, of the Kent Road.

E. T. is advised to take the opinion of some experienced scientific man in whom he can place implied confidence, before he proceeds to more expense. The only means of securing the exclusive benefit to himself is by taking out a patent, which will cost him £130.

An Old Subscriber is informed that the address required is *Mr. Joseph Duce, Wolverhampton, Staffordshire.*

The Letter alluded to by J. J. we have never seen.

W. S. is mistaken with respect to the cost of the materials employed in the process he mentions: his substitute would come rather more expensive.

Communications received from O. N.—I. Truman.—Nihil.—Theodosius B.—and A Cotton Spinner.

Printed for and published by GEORGE HEBERT, 88, Cheapside; to whom all Communications (post paid) for the EDITOR are to be addressed—and Sold by SHERWOOD, JONES, and Co., Paternoster Row; SIMPKIN & MARSHALL, Stationers' Hall Court; and may be had of all Booksellers in Town and Country.

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REGISTER

OF

THE ARTS AND SCIENCES.

No. 46.] SATURDAY, JUNE 18, 1825. [Price 3*d*.

CONTENTS :—The Diorama, 338—James's Patent Steam Coach, 341—Novel and Important Application of Steam, 342—Anti-Incendiary Composition, 342—Simple Letter Copying Machine, 344—New Mode of supporting Topmasts, 345—Coverings for Roofs, 347—Miniature Painting, 348—Effacing of Grease Spots from Paper, 349—Miscellaneous Articles, 350—Patents, &c. 352.

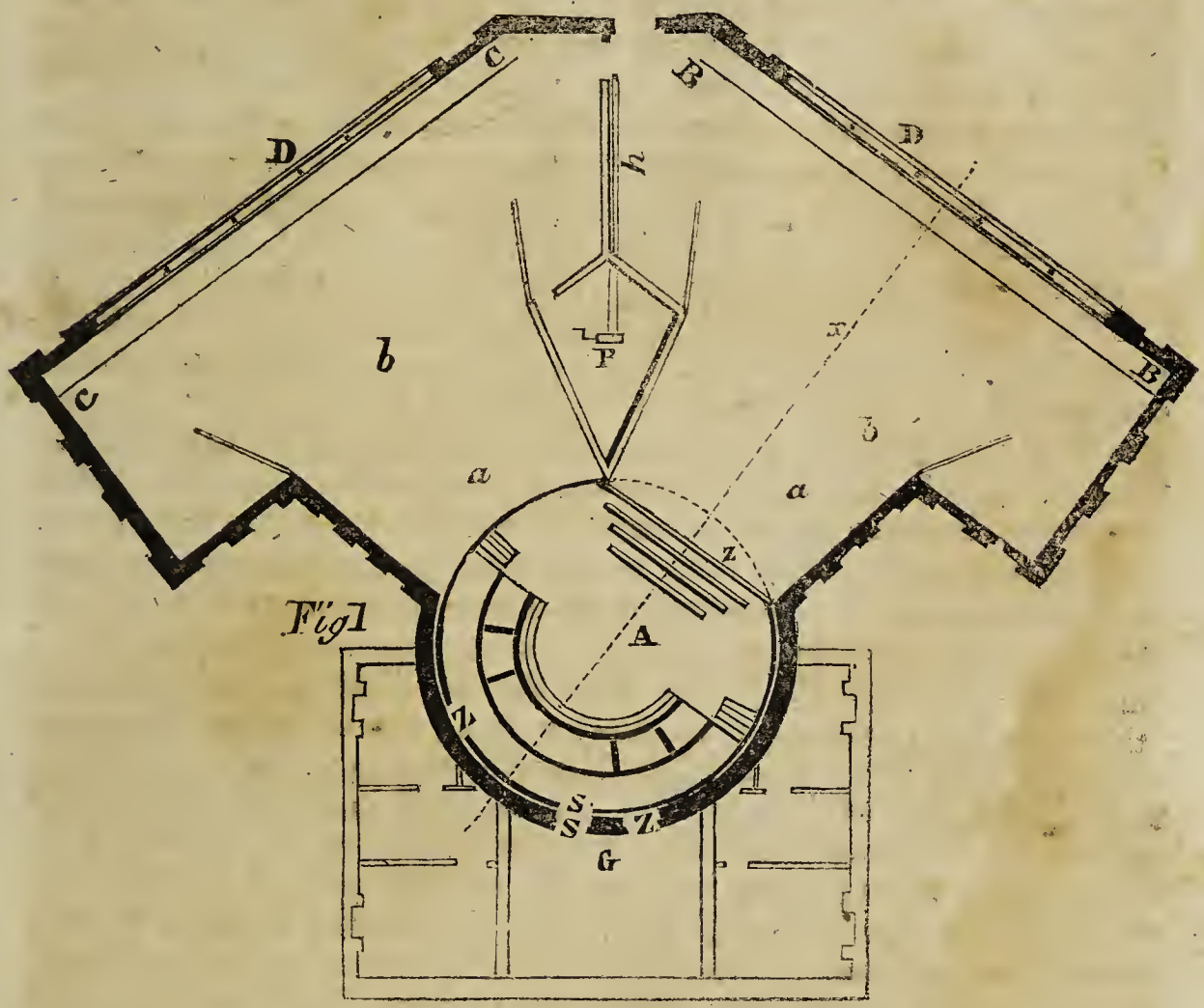


Fig. 1

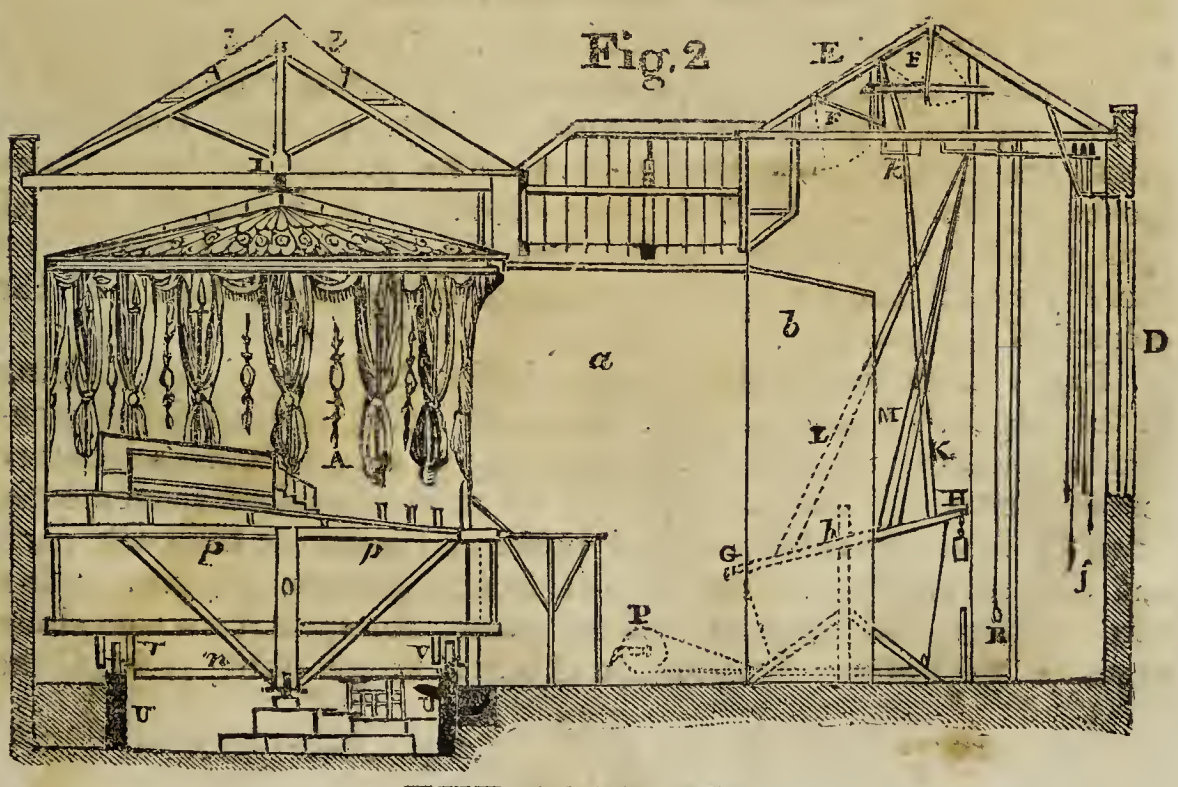


Fig. 2

THE DIORAMA.

THE DIORAMA.

Among all the contrivances to gratify the public curiosity the above exhibition stands certainly pre-eminent. The imposing magnificence of the subjects, the splendour of the paintings, the vivid illusion of the scene—all conspire to render it an object of supreme interest and delight to this sight-seeking nation; and the popularity which it has attained, founded on the sure and permanent basis of real excellence, is a certain indication of its intrinsic value as a work of art: and we do not know that we could present our readers with a subject of greater present interest than a description of the means by which this illusion has been effected. We have availed ourselves of the kindness of the proprietors in gathering the materials for this description, and we feel assured that the gratification we have personally experienced will be fully participated by all those who are desirous to see the efforts of art properly and legitimately directed.

The invention consists in placing the pictures or painted scenery (which are intended to form the exhibition) within a building so constructed, that the saloon or amphitheatre containing the spectators may be caused to revolve at intervals as may be desired, for the purpose of bringing in succession two or more distinct scenes or pictures into the field of view, and without the necessity of the spectators removing from their seats; from this arrangement of the revolving saloon, the scenery or pictures themselves may remain stationary, and will therefore admit of the application of an improved method of distributing or directing the day-light upon or through them, so as to produce the effects of varying the light and shade in a more pleasing manner than has hitherto been accomplished. The effects are produced by means of a number of coloured transparent and moveable blinds or curtains, some of which are placed *behind the picture* for the purpose of intercepting and changing the colour and shades of the rays of light; which being permitted to shine or pass through certain semi-transparent parts of the picture, produce many curious changes in the appearance of the colour, in proportion as the coloured blinds are moved up and down. This motion is performed in a peculiar order by the aid of cords connected with machinery, which we shall presently describe. Other coloured transparent blinds are situated above and in front of the picture, which are also moved by lines, and by that means distribute or direct the rays of light which are permitted to fall upon the *face of the picture*, and thereby effect many surprising changes in the appearances of the colours of the painting.

Fig. 1 in the frontispiece gives a horizontal plan of the building in the Regent's Park, in which are now being exhibited two magnificent pictures, each of them consisting of several thousand square feet of canvas. A shews the plan of the revolving saloon conveniently fitted up with a circular range of boxes and seats at the back part, and with several rows of benches in front; the remaining space is a carpeted floor laid upon an inclined plane, for spectators who chuse to stand. B B shews the situation of one of the pictures; and C C the

situation of the other. D D are two large windows fitted with ground or semi-transparent glass, to admit a portion of light behind the pictures. The saloon is a building of a cylindrical form, and has a spacious opening, *z*, in one side, for viewing the picture through. The doors for the admission and departure of the company are situated at S S and Z Z on the opposite side. The spaces between the opening of the saloon and the pictures is inclosed above and on each side by light screens, forming a kind of vista, (as seen at *a a* and *b b*) which, concealing the margin of the picture, produce in a certain degree the effect of panoramic pictures.

Fig. 2 represents a vertical position of the building and apparatus in the direction of the dotted line *x* drawn on the plan, and the letters of reference are the same in both of the figures for the corresponding parts. Consequently A shews the saloon, the walls of which are elegantly decorated with drapery and painted devices; and the ceiling, which is of a slightly conical figure is tastefully ornamented with a transparent painting, which designedly admits of but a very sombre light from sky-lights placed above. B is one of the pictures suspended from above, and kept in a proper degree of tension by small weights hung on at bottom, and also at the sides, at which place the lines for the weights pass over small pulleys fixed to a stationary rail not shewn in the drawings. Before the window D the coloured transparent blinds are suspended by lines so as to be capable of moving up and down, in order to pass by and overlay each other; five of these are represented at *j*, but there may be a considerably greater number used, which will depend entirely upon the nature of the painting or scenery to be exhibited, and must, as well as the arrangement of their movements, and also the colour of the cloth, be determined by the judgement of the painter. E shews a large sky-light in the roof of the picture room for the admission of light upon the face of the picture; this window is likewise fitted with ground glass and furnished with transparent coloured blinds as seen at F F, which move upon hinge joints fixed to their uppermost ends, so as to be capable of moving into the dotted position, thereby permitting the rays of light to fall unobstructed upon the face of the picture; when they are raised up as shewn in the figure, they intercept part of the light, and when brought fully up they may be made to close up the window entirely, and thereby cause all the rays of light to pass upon the picture through the coloured shades, so as to produce variations in the shades and tints upon the picture.

The coloured blinds are moved by cords or lines, which proceeding from them, pass over small pulleys near the top of the building, and then descending are attached to a long lever or balance G H, which moves upon a centre or fulcrum at *h*. This part of the apparatus is situated in that intermediate portion of the building between the two picture rooms, as seen at *h* in the plan, *fig.* 1. The lines K proceed over small pulleys, *k*, and over leading pullies situated at the end of the roof of the building, after which they are attached to the extremities of the blinds, F F, in order to close or open them. There are five pairs of these blinds in the length of the building, but only

one pair exhibited in the figure. The cords marked L, and those marked M, proceed over small pulleys in the roof of the building, and are then attached to the hanging blinds *j*. The lower ends of these cords, L and M, are attached to the lever G H on opposite sides of the fulcrum, consequently when the lever is moved on its centre some of the blinds will ascend and others descend, so as to pass over each other, and produce different tints of light; but no precise or even general rules can be laid down for these motions, as they must depend entirely upon the nature of the scene and the intention of the artist. When it is desired to produce the effect of change in the lights and shades of the picture, a workman draws the end H of the lever slowly downwards, by turning the winch P shewn in *fig.* 1, and also by dotted lines at P in *fig.* 2, where two ends of a rope proceed over pulleys and are attached to opposite ends of the lever G H; this rope winds round a barrel which is turned by a pinion and cog wheel from the winch P, and the ends of it pass off on opposite sides of the barrel, so that a variety of changes is produced by turning the winch round in contrary directions. A balance weight is attached to one end of the lever, G H, for the purpose of balancing the weight of the blinds. The extent of motion which the various coloured blinds may require to have communicated to them, can be obtained by attaching their lines or cords to the lever G H nearer to or further from the centre of motion.

The floor of the revolving saloon is supported upon a very strong timber frame work, which consists of a central shaft or axis *o*, having twelve timbers or arms similar to those at *p p*, arranged round it at equal distances in the manner of radii; the extremities of these timbers are connected together by upright pieces; and the whole framing further strengthened by diagonal braces and cross timbers, which proceeding from one arm to the next, are firmly bolted to each, and form a pentagonal framing. The cross timbers serve to carry the bearings of twelve strong iron shafts which form the axes to twelve cast iron wheels or rollers, two of which are shewn at *v v*. These wheels roll round upon the surface of a circular metal curb or ring, firmly bolted to a course of masonry situated upon the top edge of the circular wall U U. This wall having to support the revolving amphitheatre above, has a very solid foundation many feet below the surface. The central shaft *o* is furnished with a pivot or gudgeon at its lower extremity, which works in a brass step-piece, is fitted with adjusting screws, and securely fixed on a pier of masonry. The cylindrical part of the saloon above the floor is composed of light wood framing, internally decorated as before-mentioned. The roof of the saloon is furnished with a gudgeon or pivot in the centre, adapted to turn round in a beam affixed to one of the principals of the main roof as seen at I. *l l* shews a sky-light for admitting light through the transparent cieling of the saloon.

The extent of the circle described by the revolving motion of the saloon in exhibiting the two pictures alternately, forms an arc of about 73°; and during the time that the saloon is in motion no company is permitted to go in or out; but when the opening S is brought

in the proper situation opposite to either of the pictures, one of the two doors *s z* of the saloon will be found to correspond exactly with one of the door-ways respectively marked *s z* shewn in the circular brick wall surrounding the saloon, and will thus open a direct entrance to it. On the outside of this circular wall a suitable room at R is provided for such of the company to wait in that arrive at the moment the saloon is in motion.

We have now only to describe the method by which the revolving motion of the saloon is effected, and we regret that the very limited space allowed for the delineation of this part of the machinery renders it not very clear in the figure (2); but as mechanical contrivances of this kind are generally well understood, we trust that the following description will be intelligible. A portion or segment of a wheel with cogs *n* is firmly fixed to the central shaft *o*, so that its cogs may be engaged with the cogs of a pinion fixed upon a vertical shaft, which has a bevilled wheel at its lower extremity; this wheel is engaged with the teeth of another bevilled wheel placed in a vertical position; and as the axis of the last-mentioned bears also a cog wheel, they revolve together; this train of wheels is set in motion by a small pinion, which is immediately operated upon by the turning of a winch with a fly wheel upon the same axis to regulate the power.

JAMES'S PATENT LOCOMOTIVE COACH.

From the talent now devoted in the construction of locomotive carriages, we may hope to see soon realized those important public benefits which have hitherto been only beheld in the distant perspective. That ingenious mechanician Mr. H. W. James, of Thavies Inn, Holborn, has recently taken out a patent for a steam-coach, which he is now actively engaged in the building of. We hoped to have given an illustrative engraving and a detailed description of the invention in our present number; but the patentee having introduced some improved modifications of a desirable and promising nature, we defer their insertion until the apparatus is complete. As the subject of mechanical locomotion is however one of great and general interest, we have collected the following leading features in Mr. James's patented improvements, and the advantages expected to result from their adoption.

Separate high pressure steam engines (of small dimensions and of an improved construction) working independently of each other, are adapted to the gear of the carriage-wheels separately, whereby various velocities may be given to the respective wheels, which are essentially requisite, in order to pass round corners or turns in the road. When the carriage has to move in a right line, equal quantities of steam are caused to issue to the engines placed on the opposite sides of the carriage; but in making turns or corners in the road, a portion of the steam is shut off from the engines actuating the inner wheels, and transferred therefrom to the engines actuating the outer wheels; by which means a slower movement is given to the inner wheels, in proportion as the outer wheels acquire a quicker move-

ment; and the operation is effected in the most simple manner, by the guide or coachman moving a lever which turns two stop-cocks placed in the centres of the lateral pipes communicating and supplying with steam the opposite engines. The steersman or engineer have likewise the power of increasing or diminishing the velocity of the carriage by closing the steam passages with a similar movement to the last mentioned.

By causing an equal expenditure of steam in equal times the patentee adapts its powers to the resistances; for in proportion as an ascent retards the motion of the carriage, the steam power accumulates, and overcomes resistance.

In descending hills the engineer has the power of locking one or more of the wheels, the remainder continuing to be acted upon by the engines.

The load upon the carriage is equalized, each wheel bearing its respective proportion; and by a peculiarly constructed axletree, each of the wheels may rest upon a different level. Thus each bears its respective portion of the burthen, producing the requisite friction upon its periphery, and enables the carriage to be propelled over hills and irregular surfaces.

Means are provided to prevent any issue of smoke from the engines; or noise occasioned by the machinery, and the escape of the steam. The effects of a radiation of heat from the furnace is excluded from the passengers as well as danger from the bursting of the apparatus.

The patentee has devoted much study to the reducing of the weight of the engines, and other moving parts of the machinery, so as to admit of an increased velocity without injury to them, and in the economising of the expenditure of fuel and water, which we shall more particularly notice in our future account.

We are given to understand that Mr. James calculates the weight of a carriage complete, adapted for twenty-four passengers, at only 30 cwt., and that it may be made to move with any speed thought proper.

NOVEL AND IMPORTANT APPLICATION OF STEAM.

Water having been suspected for centuries to be a supporter of combustion, and of late years proved to be, (as in the case of the American water-burner;) it has often appeared to us very remarkable that nobody should have availed themselves of the knowledge of so important a fact to apply it to a more useful purpose.—We have however now the pleasing task of announcing to our readers, that the ingenious Mr. Evans, of Bread Street, Cheapside, has made a most admirable application of this interesting discovery, the value of which on account of its extensive usefulness, is incalculable.

The experiment was made upon a high pressure engine, which Mr. Evans employed in his manufactory. He procured a piece of lead pipe with a stop cock, which he had soldered on to the waste pipe of the engine, through which he conducted a portion of the steam underneath the furnace bars of the boiler. A short time after

turning on the steam, he found that the guage indicated five pounds more pressure upon the inch than he could otherwise get the steam without forcing; convinced by so favourable a result, he has since substituted for the first pipe another of larger dimensions, and has now ascertained that a saving of from thirty to fifty per cent. is effected in the expence of working the engine.

Mr Evans's premises being situated in a respectable and closely built neighbourhood, he was anxious to try every means in his power to prevent all annoyance from the emission of smoke: with that view he made trial of coke in his furnace, but was under the necessity of relinquishing it, finding that he could not therewith raise the steam higher than eighteen or twenty, however unsparing the quantity employed. Subsequently to this, having discovered so valuable an auxiliary to the furnace as steam, he made a fresh trial with coke instead of coal, the result of which exceeded his most sanguine expectations, the steam from the boiler being now kept up steadily at from 32 to 35. The quantity of coke consumed was from 6 to 6½ compared to 5 of coal, thereby reducing the expence nearly one half. Mr. Evans considers it probable that the fire will decompose a still greater quantity of water in the state of steam, consequently a further saving may be made by the combustion of its hydrogen.

The immediate benefits of this discovery are in its applicability to all engines at present erected, in the working of which, the saving of expence will be immense. In locomotive engines, and steam navigation the advantages will be still greater, by a vast reduction in the freight or tonnage of fuel. It is impossible to determine the extent of the usefulness of this invention; a new field is opened for speculation, and for the exercise of inventive talent to which no limits can be assigned. A new creative power is furnished to our manufactories, the result, who can tell.*

ANTI-INCENDIARY COMPOSITION.

(From a Correspondent.)

The fatal consequences which attend conflagrations so common in this country, are so dreadful and prejudicial to mankind, that every attempt to avert them has continually been encouraged and rewarded by every friend of humanity. A discovery has been lately carried so far by a French gentleman now in London (at No. 20, Newman Street) that ships, houses, and manufactures of every description need be no longer exposed to the destruction of fire. One would hardly believe that by the means of a composition which can be adapted to any object whatever, and even to cloth, without reducing its flexibility; wood, paper, and straw can also be rendered by it flame-proof. The proprietor intends to dispose of his secret in favour of such as would buy it for the benefit of this country.

* Since writing the above we have seen the engine and apparatus in operation, and were informed that some inconvenience had arisen by the re-formation of water by the inflammation of the hydrogen. A vacuum being necessarily produced by the condensation, Mr. Evans thinks it probable the circumstance may lead to the creation of a new mechanical power.

SIMPLE LETTER-COPYING MACHINE.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"MR. EDITOR,

"YOUR "Well Wisher" will find the following simple contrivance for copying letters as effectual as a more complicated and expensive apparatus.

"Take a roller of beach or any hard wood, about 18 inches long and 1 inch in diameter, and having cut a longitudinal slit therein nearly the whole length, insert in it, and fasten with glue very neatly, a slip of strong cloth, about 14 inches wide and 18 inches long; the remaining part of the roller will serve as a handle, and may be cut with several faces to obtain a firmer hold.

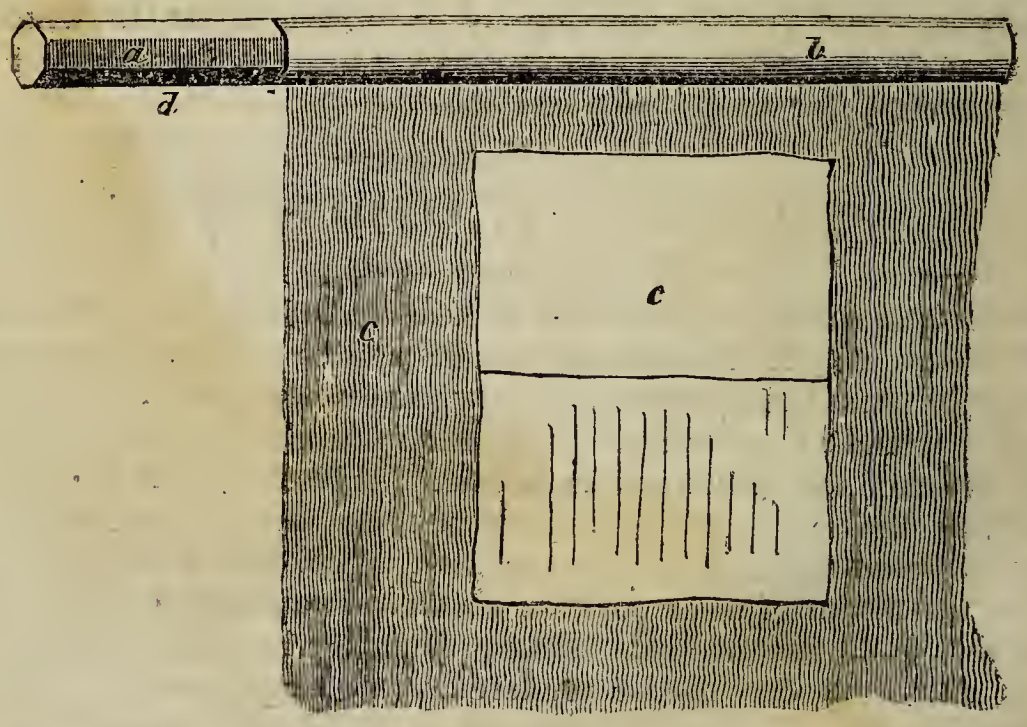
"To use this copying press, lay the sheet of paper on which the letter is written upon the slip of cloth, on that place the thin copying paper, and upon these lay a piece of thick baize or a horse-hair pad, then roll the whole round the roller, and grasping that part where the cloth is with the left hand, turn it round with the right, gradually increasing the grasp of the left; the pressure is very great, and has been found quite sufficient to transfer the letter to the copying paper.

"I remain, Sir,

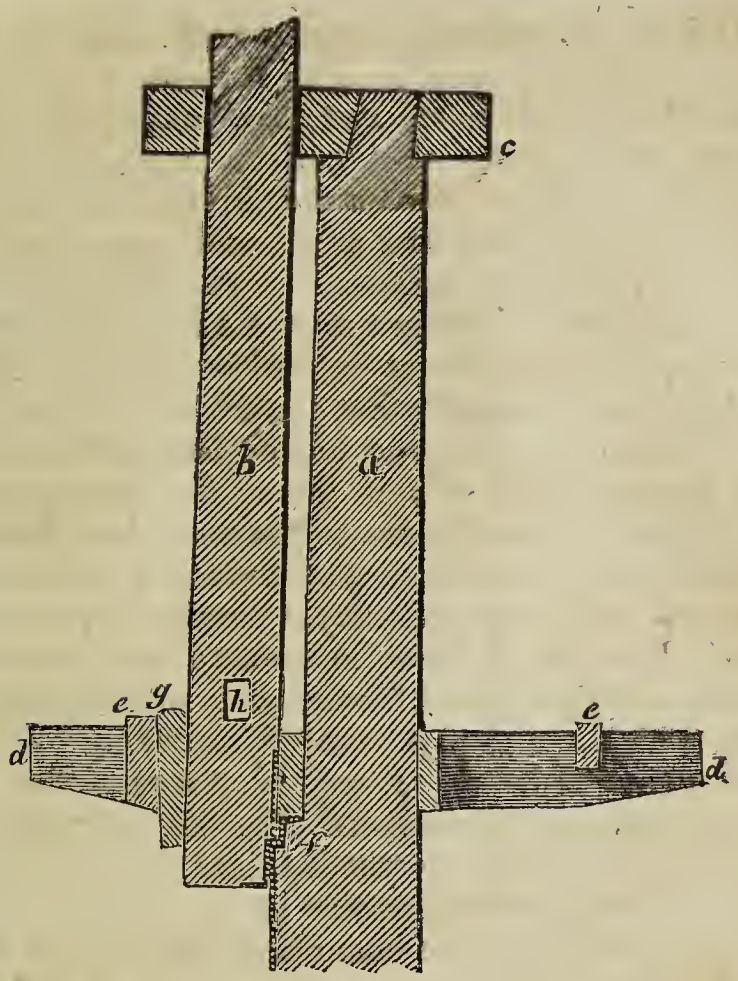
"Your most obedient Servant,

"*Charlotte-Street,* "W. H. PITCHER.
"*June* 2 1825."

The following is a sketch of the apparatus.



a b Roller.
c Slip of cloth.
d Handle.
e A letter laid on the cloth to be copied.



NEW MODE OF SUPPORTING TOPMASTS.

(From the Transactions of the Society of Arts.)

The common mode of supporting a Topmast is by means of a fid, or bolt, of iron or wood, which passes transversely through the masts near its base, and rests by its two ends on the tressel trees, which form part of the top or framework of timber, which, together with the cap at the head of the lower mast, (through which also the topmast passes,) supports this latter in a vertical position. It is also supported laterally, in two opposite directions by the shrouds, which are strong ropes fixed at their lower end, some to the side of the vessel and some to the top of the lower mast, and all of them secured, at their upper end, to the head of the topmast.

In heavy gales, when a vessel is under way, or at anchor, the impulse of the wind against the mast is such that it acts like a power applied at the end of a very long lever to bury the lee side of the hull in the sea. The obvious remedy for this would be to lower or slide down the topmast, and thus to reduce the length of the lever; and, to a person unacquainted with practical navigation, the only operation apparently requisite for this purpose would be to knock out the fid and then to lower the topmast through the interval between the two tressel-trees.

The weight, however, of the topmast, with all its appendages, occasions so enormous a pressure on the fid that it is found quite impossible, by any power which can in that situation be applied, to drive out or withdraw the fid without previously taking off the pres-

sure. This is done, or rather attempted to be done, by attaching a rope to the heel of the topmast, leading it through a block hooked on to the cap of the lower mast, and then conveying it below to the windlass or any other power that can be most conveniently made use of. But as in gales of winds the shrouds are always drenched with wet from the spray and the rain, and as a dry rope always shortens by being wetted, it follows that the tension of the topmast shrouds is at such times acting in the same direction as the weight of the topmast, and in the direct opposition to the heel rope, on which account it rarely happens that the fid can be relieved.

The tension of the shrouds may indeed be taken off by slackening them; but in proportion as this is done, the lateral support of the topmast is diminished, and the most imminent hazard is incurred of its being blown away. To lower the topmasts therefore, while a ship is under way, however conducive it may be to the case and even to the safety of the vessel, is a manœuvre not often successfully attempted even on board men of war, and scarcely ever on board merchant men, which are always scantily manned.

The above mentioned very serious objections to the common way of securing a topmast, have induced Mr. Smart to propose the following plans which, although as yet it wants the sanction of experiment has been taken into consideration at two successive committees, and from its there obtaining the unanimous approval of naval officers and other professional men, is now offered to the public through the medium of the society.

A little below the *hounds*, or shoulder of the lower mast, which supports the framework of the top, is to be formed a step. This may be done by bolting a fish to the mast in that part, if the mast is a single tree; but if built of several spars, as all large lower masts are, there will be no difficulty in making the step without the use of a fish. The face of the step is to be a plane declining outwards, and is to be strongly plated with iron or copper. A shoulder fitted to this step, and like it covered with metal plate, is to be cut in the heel of the topmast *b*, the whole weight of the topmast will therefore rest on and be supported by the step in the lower mast, and as the area of the step will be at least equal to that of the top of the fid hole *h*, the one will be no more liable to crush in by the superincumbent weight than the other. In order to prevent the topmast from being thrown off its step by any lateral motion, a wedge *g* is driven between the topmast and the cross-tree *e*. The fid *h* is proposed to be retained, but only as a preventer in case of accident; for the bottom of the fid-hole being placed an inch above the tressel-tree *d d*, it is manifest that it bears no part of the weight of the topmast as long as this latter rests on the step *f*.

In order to strike or lower the topmast, the heel-rope with its tackle, is first to be applied, then the fid *h* is to be withdrawn, after which the wedge *g* is to be knocked out, and this will be done with comparatively little difficulty because the lateral pressure of the mast cannot be much, and because any difficulty likely to arise from this cause may be obviated by proportionally increasing the angle

of the wedge. Nothing now remains but the exertions of two or three men with handspikes inserted between the two masts near the tressel-trees, to trip the topmast off the sloping step *f*, and to lower it in the usual way by means of the heel-rope.

Reference to engraving. The figure is a sectional representation; *a* the upper part of the lower mast, *b* the lower part of the topmast, *c* the cap, *d d* one of the tressel-trees, *e e* the cross trees, *f* the step on which the topmast is supported, *g* the wedge by which the topmast is secured in its place, *h* the preventer fid.

COVERINGS FOR ROOFS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IN the last number of your valuable Work I perceive the following enquiry under the initials W. R. 'What makes the 'most economical covering for the roof of a house, or other building, 'durability being considered?' This is a question which I should very much like to see satisfactorily answered, as it is one of universal importance. From the variety of coverings that are used in common it is evidently undecided by builders whether slates, lead, copper, or tiles are best. The several substitutes for materials of this kind that have lately been proposed it may be presumed do not answer from their very rare adoption, it being well known that builders are always alive even to the most trifling points of economy in building a house. The four substances I have mentioned may therefore perhaps be considered the principal if not the only materials generally approved of. For flat roofs, copper or lead appears to be indispensable, and the economy of these (which are both very durable) will depend upon their relative prices at the time. The thickness of copper for such purposes should not be less than sixteen ounces to the superficial foot, that of lead of seven pounds to the same measurement. It follows as a corollary that the timbers to support the lead should be seven times as strong (as those for copper) to support its superior weight. These are points, therefore, upon which an accurate estimate must be made, together with other circumstances upon which my limited knowledge forbids me to enter, but which I hope to see discussed by some of your able correspondents.

"With respect to tiles and slates it has been ascertained that a square of 100 superficial feet will take

Of slates, upon an average, about	7 cwt.
Of pan tiles,	9½ cwt.
Of plain tiles,	18 cwt.

Slates absorb no moisture, or so little as need not be brought into the calculation; tiles absorb about a seventh part of their weight. Therefore it may be said in round numbers that the timbers to support pan tiles should be 1½ times as strong as for slates, and for plain tiles three times as strong. These are some of the data upon which

calculations and comparative estimates must be made, but which I leave to abler hands than my own.

"It may not be amiss to add here an account of an experiment made by the Bishop of Landaff on the absorption of water by tiles and slates. He observes, 'I took a piece of Westmoreland slate, 'and a piece of common tile, and weighed each of them carefully; 'the surface of each was about thirty square inches; both the pieces 'were immersed in water for ten minutes, and then taken out and 'weighed as soon as they had ceased to drip, and it was found that 'the tile had imbibed about one seventh part of its weight of water, 'and the slate had not imbibed a 200th part of its weight. Indeed 'the wetting of the slate was merely superficial, while the tile in 'some measure became saturated with water. I now placed both 'the wet pieces before the fire; in a quarter of an hour's time the 'slate had become quite dry, and of the same weight it had before it 'was put into the water; but the tile had only lost twelve grains of 'the water it had imbibed, which was as near as could be expected, 'the same quantity which had been spread on its surface, for it was 'this quantity only which had been imbibed by the slate, the surface 'of which was equal to that of the tile. The tile was left to dry in 'a room heated to 60° of Fahrenheit, and it did not lose all the water 'it had imbibed in less than six days.'

"*Mile End,* "A COPPERSMITH."

"12*th June,* 1825.

MINIATURE PAINTING.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I OBSERVED in the last number but two of your valuable publication, a letter signed 'An Amateur Miniature Painter,' requesting to know the method of preparing ivory preparatory to painting on it. Now by this request the writer clearly shows that he knows nothing about miniature painting, or he certainly could have obtained an answer to his question from the same source from which he got his knowledge of painting.

"Now you see, Mr. Editor, the case is this: every young child, whether rich or poor, that takes his pencil in his hand, and attempts to copy a print, is considered by his ignorant parents a prodigy; they immediately write him down as an artist because he had *such a genius* for drawing; and if, Mr. Editor, you will take the trouble to walk from Blackfriars-Bridge, through Fleet Street, and the Strand, as far as Charing Cross, you will find what I say is not without foundation. How much better would it be if those persons calling themselves painters, had been brought up to some useful trade or profession, to which they could have done more credit; for it really is distressing to see the delightful art of painting so barbarously ill-used.

"Now the writer of the letter before us appears to be of this class of painters; and thinking it beneath a professor to ask for in-

formation that every professor is supposed to possess, he has styled himself an amateur. That he has not studied under a master is evident; that he is not acquainted with any miniature painter is also as clear; now I contend that a person who has time to pursue painting as an amateur, generally has the means of either taking lessons, or of being in company with artists.

"To conclude, the only method I can recommend after that of taking lessons, is the perusal of works on miniature painting; such as Mansion's Letters, Tegg's Young Artist's Assistant, the Art of Miniature Painting, each of which promises to render any gentleman or lady a miniature painter without the *aid of a master*, and which I have no doubt will give ample satisfaction.

"I remain, Mr. Editor,

"Yours respectfully,

"*June 7th*, 1825." "A PROFESSOR."

[A method of whitening ivory by immersion in a strong solution of alum is given in our seventh number, page 110. Another very common process is to cover the ivory with powdered quick-lime, and slaking it gradually by sprinkling with very small quantities of water at a time, otherwise the great heat would cause the ivory to scale or split.] Ed.

EFFACING OF GREASE-SPOTS FROM PAPER.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"In answer to the inquiry of "A Constant Reader" contained in your 29th number, as to the best method of effacing grease spots from paper without injury to its texture or appearance, I beg to inform him that I have successfully employed the following process:

"After having gently warmed the paper stained with grease, wax, oil, or any fat body whatever, take out as much as possible of it by means of blotting paper; then dip a small brush in the essential oil of well-rectified spirit of turpentine, heated almost to ebullition, (for when cold, it acts only very weakly,) and draw it gently over both sides of the paper, which must be kept carefully warm. This operation must be repeated as many times as the quantity of the fat body imbibed by the paper may render necessary. When the greasy substance is entirely removed, recourse may be had to the following method to restore the paper to its former whiteness, which is not completely restored by the first process. Dip another brush in highly-rectified spirit of wine, and draw it in like manner over the place which was stained, and particularly round the edges, to remove the border which would still present a stain. By employing these means with proper caution, the spot will totally disappear, the paper will resume its original whiteness, and, if the process has been employed in a part written on with common ink, or printed with printer's ink, it will experience no alteration.

"*Pimlico, June 7th*, 1825. "A SUBSCRIBER."

MISCELLANEOUS INTELLIGENCE.

Quantity of Heat disengaged during Combustion.—It has been found by M. Despretz, that hydrogen-gas in burning melts 315.2 times its weight of ice, and carbon 104.2. M. Wetter remarks, that these numbers 315.2 and 104.2, are almost precisely proportional to the weight of oxygen absorbed by the hydrogen and the carbon; and it appears by the chemical proportions of Berzelius, that the first number being 315.2, the second will be 104.66. This discovery is in accordance with M. Wetter's conjecture, *that the quantities of heat disengaged are in definite proportions.*

Examination of fused Charcoal.—A specimen of fused charcoal, or supposed artificial diamond, has lately been examined. It was obtained by Professor Macnevin, of New York, by means of Dr. Hare's deflagrator, and was sent to Mr. Vanaxem, for examination, that gentleman having always been very sceptical on the subject. It consisted of a large and small globule connected together by a thread, colour black, without lustre, and opaque. When struck it yielded without breaking, receiving a polish like that of iron; when filed it gave way as iron, or soft steel would do; it was attracted by the magnet, and malleable under the hammer. Nitric acid when heated, acted violently upon it, and ultimately peroxide of iron and a little silica were obtained. The proportion of iron to metallic iron 11.5. Drs. Silliman and Hare, however, deny that Mr. Vanaxem has operated on a proper specimen.—*American Journal.*

Capillary Attraction.—It is stated by Mr. Gilleron, that if a capillary tube be introduced into mercury, the metal will remain in the tube below the exterior surface. If then the tube be carefully raised, without taking it out of the mercury, the surface of the mercury in the tube may be raised to the level of that without. Operating very carefully it may even be raised still higher; its surface will then become concave, the nature of the curve apparently approaching that of the catenarian curve, which I believe to be also that of liquids, which in capillary tubes are raised above the level of the external surface. If then the tube be depressed a little, the convex surface may again be given to the mercury in the tube, without its level being depressed below that of the external portion. It appears to me, therefore, that the surface of liquid in capillary tubes, is an accessary circumstance, and has no direct influence on the elevation or depression of the liquid.—*Biblio. Univer.*

The Face of a Steeple Clock illumined by Gas, has been rendered equally readible in the night as in the day, at the Tron Church, in the city of Glasgow. A gas-lantern, whose exterior (except on the side next the steeple, where it is glazed) tastefully represents the bird called the *phœnix*, is supported at several feet distant from, and level with the upper part of the clock-face, by two supports acting braceways to each other, and steadied, laterally, by two chains proceeding from the corners of the steeple; the main of these supports

is the gas-pipe which supplies the lantern, and the other is also a gas-pipe used for lighting the lantern. It effects this by means of numerous equi-distant small holes, or narrow cross slits in its side, and is called the *flash-pipe*. At sun-set when the lantern is to be lighted, the lamp-lighter, by means of their cocks fixed within his reach in the street, turns the gas into both of these pipes, and after waiting a proper time for the gas to ascend to the lantern, he applies his flambeau to the jet of gas issuing from the lowest of the holes in the flash pipe, the flame from which instantly communicates to the jet next above it, and so on, until in a few moments this chain of flame enters the lantern, and lights the burner of the main pipe; which being perceived by the illumination on the clock-face, the flash-cock is then turned off, and no further attendance is needed, until about sunrise, when the other cock is shut off, and this clock lantern extinguished in its turn with those in the adjacent street. The lantern is curiously glazed convexly in five panes; and a number of plane mirrors are concavely fixed behind the burner, to act as a reflector in throwing the light principally on the clock-face. In the supporting gas-pipes above mentioned, there are air-tight hinges, which admit the lantern being moved by help of the chains, and brought within reach of a person at a window of the steeple, who daily cleans the mirror and glass front of the lantern.—*Monthly Mag.*

Composition of common and deoxidized Indigo.—M. Dalton states that in various experiments made at different times, but with very similar results, he finds that the quantity of oxygen required to convert the green or deoxidized indigo solutions in lime-water into blue indigo, is about one seventh or one eighth of the weight of the resulting indigo; on the supposition that an atom of oxygen was added to one of indigo, concluded that the atom of indigo must weigh about 55 or 56. When indigo is destroyed by the oxymuriate, or rather, chloride of lime, as in the process adopted by Mr. Dalton for testing the value of indigo, he is persuaded from his experiments, that twice the quantity of oxygen is necessary that is required to revive it from the lime solution.

Ammoniacal Chromate of Copper.—The chromate of copper prepared by precipitating sulphate of copper by chromate of potash, and which is of a reddish brown colour, is soluble in diluted ammonia, producing a clear solution of a beautiful and deep green colour. When the solution is evaporated, the reddish chromate of copper appears as the ammonia flies off. This solution was made for decorating the front of a druggist's shop. The green is finer than most of those obtained in the usual manner, and undergoes no change by length of time, or exposure to bright light. It is readily prepared by adding the solution of chromate of potash to ammoniacal sulphate of copper. —*Journal de Pharmacie.*

The ripening of Wall Fruit May be hastened by painting the wall black, or by the laying on of a composition of a dark colour. It has also the effect of increasing the quantity of fruit, as well as improving the quality in flavour. Mr. H. Dawes, of Slough, very successfully practices this method with grapes upon an extensive scale.

RECENT PATENTS.

PORTABLE-GAS.—To Jean Francois Gravier, of Cannon-street, for a certain method of regulating the emission of flame of gas from portable reservoirs, thereby increasing their safety.—14th May. 6 months.

OVERTURNING OF CARRIAGES.—To Thomas Pyke, of Broadway, near Ilminster, for a machine to prevent the overturning or falling of carriages.—14th May. 2 months.

BRICK-MAKING.—To Alexander Galloway, of West-street, engineer, for an invention of a machine for the moulding of bricks, and other bodies usually made from plastic clay.—14th May. 6 months.

DISTILLATION.—To William Grimble, of Cow-cross-street, gentleman, for certain improvements in the construction of apparatus for distilling spirituous liquors.—14th May. 6 months.

FLAX-DRESSING.—To Edward Garsted, of Leeds, flax-spinner, for his improvement for a machine for dressing hemp flax, and other fibrous bodies.—14th May. 6 months.

WOOD.—To Henry Oswald Weatherly, of Queen Ann-street, for an invention of certain machinery, for the purpose of cutting wood and securing the same in bundles.—14th May. 6 months.

CARRIAGES.—To Goldsworthy Gurney, Esq. of Argyle-street, surgeon, for an invention of an apparatus for the propelling of carriages on common roads or railways.—14th May. 6 months.

LOCKS.—To John Young, of Woolverhampton, cooper, for certain improvements in the construction of locks for doors, and other purposes.—14 May. 6 months.

DISTILLER'S SAFE.—To James Fox, of Plymouth, rectifying distiller, for his invention of an improved safe, to be used in the distillation of ardent spirits.—14th May. 2 months.

STEEL.—To Charles Mackintosh, of Crossbasket, in Scotland, Esq. for his invention of a new process for making steel.—14th May. 6 months.

METALS.—To John Badams, of Ashted, for having discovered a certain method of extracting certain metals from their ores, and purifying them.—16th May. 6 months.

FIRE ARMS.—To Isaac Riviere, of Oxford-street, gunmaker, for his invention of an improved construction of machinery, by which guns, pistols, and other fire arms are discharged.—20th May. 6 months.

TO READERS AND CORRESPONDENTS.

The inquiries of J. S. are too indefinite; answers to them would fill a volume. He had better consult some encyclopædia.

"A Farmer in London," may see the machine itself that he inquires about at Mr. Snowden's manufactory in Oxford Street. A description of it has been published in several works many years since.

Letters from Y. Z.—A. B.—Zero—and An Old Carpenter, are received.

E. Thomas was replied to by letter in the manner requested, directed to the Post Office, Bristol, which is now returned to us, with the answer "Not called for."

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REGISTER

OF

THE ARTS AND SCIENCES.

No. 47.] SATURDAY, JULY 2, 1825. [Price 3*d*.

CONTENTS.—Opening of Suspension Rail-way, at Cheshunt, 354.—On the unimproved state of the British Silk Manufacture, 355.—On the Formation of Flexible Elastic Tubes, 357—Patent Machinery for dressing Warps in the Loom, 358.—Jump and Court's patent Salt Pans, 359,—Speers's Universal Checks, 359,—Application of Chromate of Lead in the Arts, 362,—Encyclopædia of the Useful Arts, No. XI. 362, *Miscellaneous.*—Mechanical Force of Moisture, 366,—Method of Browning Iron, 366,—Exposure of Iron to Air, 367,—Preservation of Anatomical Preparations, 367,—Sharpening of Razors, 367,—Patents, Correspondence, &c. 368.

OPENING OF THE PATENT SUSPENSION RAILWAY, AT CHESHUNT, HERTS.

OPENING OF THE PATENT SUSPENSION RAIL-WAY, AT CHESHUNT, HERTS.

INVENTED BY H. R. PALMER, ESQ.

We had the gratification on Saturday last of witnessing a practical demonstration of the advantages of Mr. Palmer's new Suspension Rail-way, the nature and construction of which having been fully described in the 7th and 8th numbers of this Work, to those articles we refer our readers, as connected with our present account.

A line of rail-way on these beautiful principles having been erected at Cheshunt, in Hertfordshire, by Mr. Gibbs of that place, the same was opened for public inspection on the above-mentioned day, when a numerous and highly-respectable company of persons attended by invitation to witness the operation of the carriages, and partake of a rural entertainment provided for the occasion. The weather proved fine during the forenoon, but the rain which afterwards occasionally descended in showers, would have been felt very inconveniently by the numerous fair visitors, had they not been provided with large booths, in which were erected ranges of elevated seats, commanding a view of the entire piece of rail-road, besides affording a fine prospect of the surrounding country, which is beautifully picturesque. Near to these was stationed a band of music, which played a variety of national airs; and the flags of England, France, America, and other nations, waving their colours in different parts of the beautiful meadows, gave a delightful effect to the scene, independently of the highly interesting business of the day.

The chief object of the proprietor of this undertaking is the conveyance of bricks across the Marsh to the River Lea for shipment, and the carriages have consequently receptacles adapted to that peculiar purpose. But on the present occasion each receptacle was fitted up with temporary seats, for the conveyance of the persons in the manner represented in the engraving; each receptacle being likewise loaded with a quantity of bricks as ballast, which were stowed away under the seats, making, perhaps, a total weight to each receptacle of one ton; and there being two receptacles to a carriage (one suspended on each side of the rail) will make the whole weight about fourteen tons. The first carriage shewn in the train * had the receptacles expressly made for passengers, and were elegantly constructed in the barouche style, the passengers sitting opposite to each other. The whole of this immense train was drawn by a single horse by means of a towing rope attached to the first carriage, and with so little exertion apparently, that it was evident the strength of a good average horse would be sufficient to draw double the weight operated upon. The rail was proved to be upon a level plane by the animal drawing the load with equal facility, in either direction. The posts which support the rail are about ten feet apart, and vary in their

* The sketch of this carriage was made from memory, and we believe incorrectly in some of the minor points.

height from two to five feet according to the undulations of the ground, so as to preserve the horizontal line of the rail. Under the rail, and between a cleft of each of the posts are placed reverse wedges, which admits of a facile and almost instantaneous adjustment of the plane, in the nicest manner.* The posts are made of that almost everlasting stuff, sound old ship timber, and securely fixed in the ground in a peculiar manner; the rail is constructed with 3-inch planks, 12 inches wide, which are placed edgeways between the clefts of the pillars. The upper surface of the rail is covered with a bar of iron four inches wide and about a quarter of an inch thick, and a little convexed on the upper side, to suit the occasionally inclined position of the wheels, and to prevent (as we suppose) a too extended contact of their surfaces.

Our object in giving another sketch of this truly excellent invention has been, chiefly to shew its admirable application for the conveyance of persons as well as goods. The vehicles glide so smoothly over the surface of the country, as to be compared only to the floating of boats in the stream of a river; and it is evident that no mode of travelling can possibly be less free from danger.

The simplicity and effectiveness of this new rail-way was the subject of general admiration; among the spectators we noticed several engineers of eminence, who, very honorably to themselves, awarded their meed of praise, so justly due to the inventor, for the erection of (unquestionably) the best rail-way hitherto constructed.† The uses and advantages are indeed so obvious to every observer, that it is impossible not to believe that it will become of general adoption in all situations suited to a work of the kind.

ON THE UNIMPROVED STATE OF THE BRITISH SILK MANUFACTURES.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IT is really surprising to see the very rapid improvements making in nearly every branch of our manufactures, and at the same time to notice the very few which have been made in the manufacture of silk. I am anxious to draw your attention, and through you, that of our mechanics, to this subject; for it is growing into one

* This simple method of adjustment is one of very considerable importance in every point of view. In the common rail-roads, when the surface has become irregular by the sinking of particular parts, the rails must be taken up of necessity, and a complete re-bedding of their foundations made, which is of course attended with considerable expence and inconvenience. By Mr. Palmer's plan a tap or two with a hammer sets the whole straight.

† Even Mr. Vallance, who may be regarded as unfriendly to rail-ways generally, very candidly says in his pamphlet on the subject, "By the effects produced on different rail-roads, it is *proved*, that a power which will raise one pound perpendicularly, will move above 100 lbs. horizontally at the same rate; and on a rail-way of Mr. H. R. Palmer's invention, it may at any time be seen, that the same power will produce the same effect on above 300 lbs!"

of the greatest importance. In another year we shall have to enter into the field of competition with the original manufacturers, who every body must acknowledge have at present the most decided advantages over us. When the measure of admitting foreign silk goods was agitated last year, the government held out that the genius of our mechanics, and the enterprize of our manufacturers, would bear down every difficulty. Half the time allowed us has elapsed, yet so far the genius of our countrymen seems to slumber. The only improvement of any consequence that has been introduced within the last ten or twelve years, is the loom for which a neighbour of mine obtained a patent, and it is an *imported* invention. It certainly is a very great improvement, but it is *French.* The loom at present in general use, is the same clumsy tool which has been employed for the last two or three centuries; and I assure you Mr. Editor, that I lately saw a man at work in the very identical loom that was made for, and first worked in, by his ancestor, when he first arrived in England, and settled at Canterbury, in the reign of "good Queen Bess:" the same old fashioned thing is continued, and notwithstanding all its inconveniences, no improvement is attempted. The same feeling of neglect of improvement is general throughout the whole trade, and I fear the masters are quite as blameable as the journeymen. Surely if proper encouragement was held out, something would be done; as it is, the loom; the winding engine; the warping mill; are all stationary, and the only good dyers we have are foreigners. But what is to me the most surprising of all, the whole system of preparing the raw thread is borrowed. It appears there has been no machine yet invented, which has proved a real improvement on the old mode of going through every operation separately, and which method was stole from the Sardinians, by one Thomas Lamb above a century ago, and who set up some mills at Derby. This was long before Arkwright commenced his improvments on Wyatt's invention of spinning cotton by machinery. Yet see the difference between the progress of the two. In one we beat every nation, and in the other every nation beats us. The highly boasted mechanical superiority of England has not availed her in the silk trade; and at present there is nothing which would lead one to suppose anything effectual will be attempted, until I fear, the trade will find it too late. A year hence all will be in vain. To you, Sir, I look to give a spur to that crawling hack,—old fashion; perhaps many things might be introduced in your very useful and entertaining Register relating to the defects and attempted improvements of the trade. If you think this worth making public, perhaps it may be noticed by others in the trade, and may be the means of doing some good.

"I am, Sir,

"Your's respectfully,

"*Wood Street, Cheapside.* "A WEAVER."

ON THE FORMATION OF FLEXIBLE ELASTIC TUBES, BY MR. THOMAS SKIDMORE.

I HAVE lately had occasion, in the practise of the arts to make use, in a modified manner, of the compound blow-pipe of Hare, supplied with oxygen and hydrogen gases; and in doing so have been compelled to seek for some material of which I could make a flexible elastic hose or tube, indispensable to my operations.

Leather in various ways was used without success. The intestines of the hog and the bullock, in their natural state, answered a tolerable purpose for a short time; but they soon cracked and exhibited fissures, through which the gases escaped very fast, and on being tanned with an infusion of sumach, became very porous, notwithstanding they were surcharged with oils, tallow, &c.

At last I imagined that caoutchouc, or India rubber, might be employed with a prospect of success; and as I obtained it, I trust it may possibly be of importance to some of your readers to be made acquainted with the process I pursued in its manufacture, the detail of which follows, and is at your disposal.

I caused small iron wire to be coiled spirally around a cylindrical rod of iron, as close as it could be laid, of the length in one instance of twelve feet. The extremities of this spiral coil were then made fast to the rod (after having been once loosened from it), in manner such that, in the subsequent operations, the convolutions of the wire should remain in contact with each other. Over this spiral coil was wound, in a similar manner, a covering of tape, ferreting, or other fabric, so as to completely invest it, and, in a process which is shortly to follow, to prevent the intrusion of the gum to be used into the cavity of the spiral coil before mentioned.

The rubber is now taken, I mean such kind of it as is sold in the form of bottles, and cut into long narrow strips, like carpet rags. This is best effected by cutting them originally into two equal parts, and then reducing them as near as may be into the shape of a circular plate, with a pair of sharp tailor's shears, which succeeds in such case much better than would commonly be imagined. These strips are wound over the covering of tape or ferreting above mentioned in a spiral manner, from one end of the coil to the other, and this in my instance was twice repeated, care being taken to lay as far as practicable, the fresh-cut surfaces in contact with each other, drawing them so tightly as to cause them, from their elastic property, to stretch to two, three, or four times their ordinary length. When this was done, another covering of strong tape (linen is to be preferred) was laid likewise spirally over or around the same from end to end, and secured upon it by very strong twine, laid as closely as could be done, and drawn as tightly as the material would permit. The rod of iron was next withdrawn; the recently-formed hose was then so far bent into a circular form as to be received into a vessel of water, in which it was boiled for an hour or two when it was taken out, the external covering taken off, and the internal wire and tape withdrawn.

The latter operation at first gave me some trouble in consequence

of the stiffness of the wire; but in preparing other tubes of the kind this difficulty was overcome by annealing the wire previous to commencing operations. In the course of my little practice, in pursuit of this object, I found that if the hose so prepared be for any purpose subjected to a second boiling, it has the effect of reducing the size of the hose considerably; so that if this second boiling be even intended, though I know of no reason to desire it unless it be to unite two pieces of hose together, this circumstauce should be taken into the account.

I know very well that hose or tubes of this material, made upon glass on metal rods, are stated to have been fabricated; yet as I was unable to succeed in that way, in specimens exceeding four inches in length, I concluded, that where twice or thrice that number of feet were wanted, the method was impracticable, and therefore pursued the one I have detailed. It resulted in a hose perfectly elastic, as you may well conceive, and though not very elegant on its exterior, yet very light, and perfectly impervious to the gases it conducts to the blow-pipe to which it is attached. *American Journal.*

PATENT MACHINE,

For Dressing, Stiffening, and Drying Cotton or Linen Warps in the Loom while working,

BY MR. JOSEPH WELLS, OF MANCHESTER.

This patent consists in some improvements or additions to the common hand-loom for the purpose of communicating the mucilaginous stiffening matter to warps, and for drying the same during the time that the weaving is going on. To effect this, certain rollers, brushes, and a fan, are worked by the same leavers which the workman operates upon in the ordinary process of weaving; and the increased force or labour, requisite to give motion to these new appendages is so slight, as to prove of no inconvenience.

The warp beam, or roller which contains the warp, is placed at the top of the loom, and about midway it passes through a reed which separates the threads; it then enters between a pair of rollers at the back of the loom; the lower roller of which is partly immersed in a trough containing the liquid mucilaginous matter usually employed in stiffening the cloth, which the roller in its revolution spreads over the surface of the warp above in a thin and even stratum, while the upper roller, which is in close contact with the lower, (the warp being between) presses out the superfluous liquid. The warp being made damp by this process, it is necessary to dry it expeditiously, and in such a manner that the threads shall not adhere to each other. No difficulty however exists in this point, as at least half a yard of cloth has to be woven prior to its arrival in the working part of the loom; and it is obvious that the rollers which supply the mucilage can be placed as far off as may be desirable. To keep the threads apart a cylindrical brush of sufficient length is caused to revolve by the action of a compound lever underneath, and having a connection with the upper part or sword of the batten, which as it is swung backwards

and forwards in beating up the weft, raises and depresses the compound lever and by that means gives a rotatory motion to the cylindrical brush, thereby separating the threads of the warp at every revolution. To expedite the drying of the stiffening matter, a rapid current of air is caused to pass over the warp by the vibration of a fan, which is kept in constant motion by means of two cords attached to the treadles of the loom.

JUMP AND COURT'S PATENT IMPROVEMENT IN THE PREPARATION OF SALT.

The ordinary method of obtaining common salt, it is well known, is by evaporating sea water in broad, shallow pans which are heated by furnaces underneath; and these pans are supplied with the water in a cold state, the repeated affusion of which materially checks the concentration. The patentees' improvement consists in concentrating the salt water by a very simple and inexpensive method, previously to its enterng the pans. For this purpose the reservoir of sea-water is elevated above the pans, and the pipe which supplies them with the brine first passes through all the furnaces beneath, which brings it quickly to a boiling temperature; in this state it is discharged by means of a curved pipe into the pans above, thereby greatly facilitating and abridging the process of concentration. A stop cock is placed in that part of the supplying pipe between the furnaces and the reservoir so that as often as it is desired to replenish the pan, this cock is opened, and the superincumbent pressure of the water in the reservoir, forces out the boiling brine from the pipe into the pans, receiving in lieu thereof the cold water from the reservoir.

CONCENTRIC CHUCKS FOR TURNERS.

(From the Transactions of the Society of Arts.)

"*7, New Inn, Feb.* 4, 1824.

"Sir,

"I wish to lay before the Society for the encouragement of Arts a Chuck, which I have invented, possessing, as I conceive, peculiar advantages, I shall be happy to attend and exhibit the same whenever the subject may come before a committee.

"I am, Sir,

"A. Aikin, Esq. "&c. &c. &c.

"*Secretary, &c. &c.*" "E. SPEER."

This Chuck consists of a succession of hollow truncated cones, fitting with tolerable accuracy into each other, the outer one screwing on to the mandril and turned like a common chuck: at the bottom is a detached circular plate of brass to force the cones out in case of any adhesion, but I have never found this necessary. It is calculated to obviate a necessity for numerous chucks which are

applicable to different kinds of work, and to save a great deal of time which is lost in preparing materials, when in the rough, for turning; in fact it may be called an universal chuck whenever the back puppet is in use.

Every one acquainted with turning is aware of the trouble attending the first fitting a piece of wood to the lathe, which seems by this contrivance, simple as it is, to be entirely obviated. Nothing more is necessary than to remove one or more of the internal cones, till there is sufficient room for the admission of the substance to be operated upon; and it affords particular facility for removing any work from the lathe (a screw for instance) which may require to be accurately fitted before it is finished.

The chuck at present before the committee is adapted to receive any work between $3\frac{3}{4}$ and one-eighth of an inch in diameter; but there can be no objection to its being carried to any extent in point of size that may be required. It appears equally well calculated for turning brass, iron, or steel, the chucking of which is, in general rather a troublesome operation, and it possesses one advantage which is, I believe, peculiar to itself, namely, that it is nearly impossible to injure the tool employed; for, as the work is carried round merely by the friction on the inside of the cone, which may be increased or dimininished at pleasure by moving the screw in the back puppet, in the event of the tool encountering a knot, or any other impediment, this friction is invariably overcome with less violence than would be requisite to break the point of the tool, and the work remains stationary.

The cones of this chuck are turned at an angle of about twelve degrees; but whether this may be the best proportion I am not prepared to say; probably, if it should come into general use the angle might be determined by the kind of work to be performed.

These cones are split in a spiral direction, from an idea that their general expansion would create a solidity of the whole, which is certainly effected, and the spiral cut was adopted lest the coincidence of two or more might throw the work out of truth. But I apprehend that if care were taken in turning the cones that none of them touched the bottom of the chuck, they would be perfectly firm without any cut.

I have had a chuck of this kind made in brass with the cones of iron, but it is cumbrous and expensive, and does not answer so well, owing to the surface of the iron offering less resistance to the work turning within it. This, perhaps, might be remedied by roughing; but I think the chuck is much better in wood, as it can be made by any common turner at a trifling expense, and possesses more strength than can possibly be required.

"7, *New Inn, May* 4, 1824.

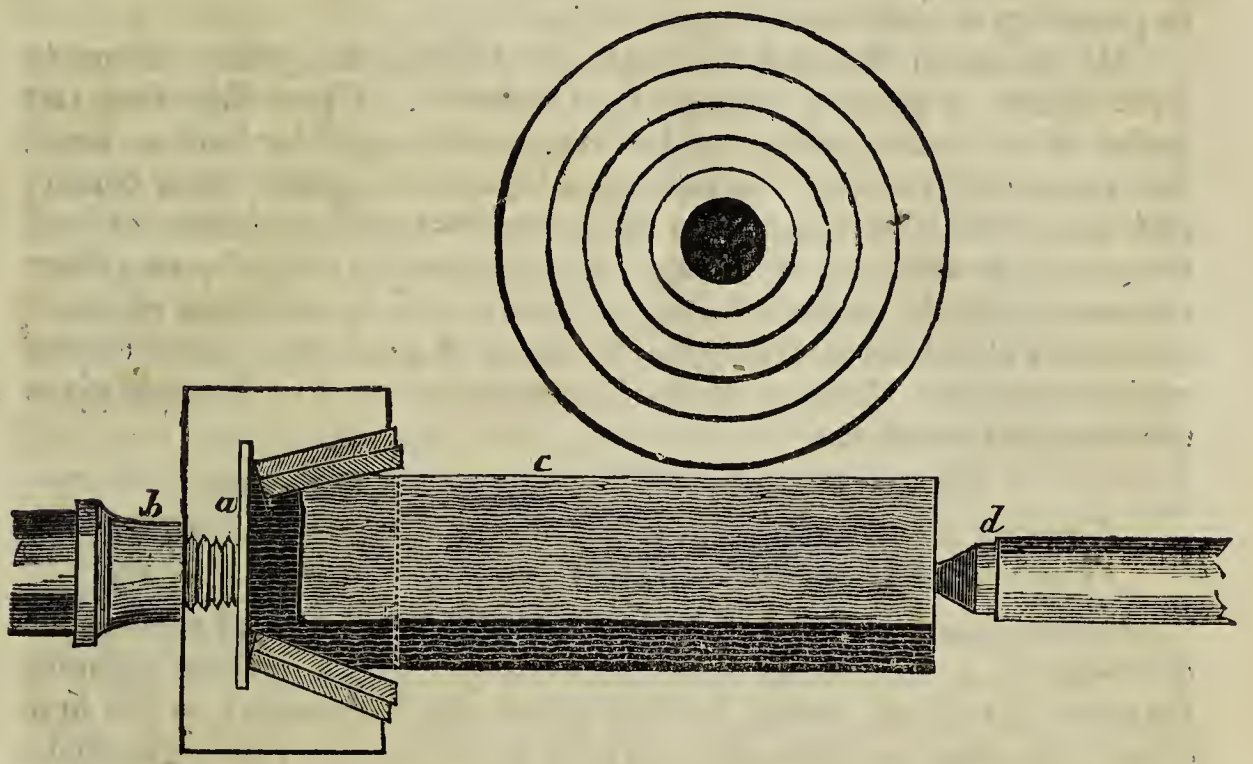
"Sir,

"I beg to transmit the chuck for which the Society of Arts have honoured me with their silver medal. The only difference between it and the one which I have already furnished

a description of is, that the cones are turned to an angle of ten degrees, and the spiral cut in them is omitted, as I find it is perfectly unnecessary, and considerably weakens the cones.

" I am, Sir, &c.

" E. SPEER."



Reference to Engraving.—Fig. 1. *b* is a front view of a chuck which consists of six hollow cones placed one within another; the whole of them may be removed by pushing a pin through the screwed hole in the back of the chuck against the plate *a*, the plate *a* must then be replaced. The hollow cones, or chucks, may then be easily pushed out from within one another till one is found that will receive the end of a piece of wood, &c. that is intended to be chucked; they must then be replaced in their respective situations in the largest chuck, and screwed on the end of the mandril *b* of the lathe, as represented in *Fig.* 2. The piece of wood *c*, intended to be chucked, must then be pushed into the hollow cone, and the conical centre *d* (of the puppet,) must be screwed against the end of the wood, which will cause sufficient friction within the chucks, so that the mandril will turn round the chucks and the wood altogether. These chucks will be found convenient for chucking the end of any irregular piece of wood, when the centre *d* can be applied to the opposite end of it, and also for chucking a piece of wood, that has been turned, when the centre has been cut off one of its ends. The chucks may be made of box, or any other hard wood that is not easily split.

NAPTHA LAMPS.—Mr. Hecker, director of the mines in Gallicia, has found that Naptha burns much better than oils or other substances in mines containing bad air, and injures the health of the workmen less.

APPLICATIONS OF CHROMATE OF LEAD IN THE ARTS.

In a paper published in the *Annals of Philosophy*, *N. S.* ix. 303, Mr. Badams describes the results of certain experiments in the composition of the scarlet or sub-chromate of lead, and the yellow chromate, and highly recommends the use of the former, as a colour either in painting, or calico-printing.

He prepares the red chromate by boiling the yellow chromate with potash, a process devised by Grouvelle. Upon digesting 100 grains of this scarlet chromate in dilute acetic acid for half an hour, and constantly stirring, the substance became of a pure yellow colour, and was found when washed to weigh only 60 grains, acetate of lead remaining in solution. On the contrary, grinding 60 grains of yellow chromate with 40 grains of oxide of lead, with the addition of small quantities of hot water from time to time, the red sub-chromate was again produced. After some further experiments, Mr. Badams gives the composition of the

yellow chromate.		*red chromate.*	
Chromic acid, 1 atom....	19.02	..... 1 atom....	19.02
Oxide of lead, 1 atom....	40.98	..... 2 atoms,..	81.96

Having made many experiments upon the properties of the scarlet chromate as a fast colour in calico-printing, and a durable pigment for artists in oil and water, he states that with the respect to the first object, the practice of the calico printer in making the yellow chromate fast, will teach him how to apply the red chromate; the colour being given to him by nitrate of lead and an alkaline solution of chromate of potash. He may accumulate besides some insoluble salts of lead in the pores of the cloth to give stability to the tint, but in all cases the colours must be heightened at last by passing them through boiling water.

The scarlet sub-chromate is extremely beautiful when ground up with oil, and possesses great body as a pigment. It is not degraded in its hue like vermillion by admixture with white lead; it mingles with other colours, and shews no signs, after long exposure, of any change by time. As a water colour it has not been tried sufficiently to authorize a positive declaration that it will not blacken; but several pieces of cards and thin pieces of paper painted with it, and hung up in situations likely to influence the colour of salts of lead have not in some months perceptibly diminished in brightness. Mr. Badams observes that should it succeed, no tint would be a more desirable accession to the pallet than a bright and permanent scarlet or scarlet-orange. *Quarterly Journal.*

ENCYCLOPÆDIA OF THE USEFUL ARTS.

No. X.—*(Continued from page 318).*

ANTIMONY, is a brittle metal, brilliant, and of a greyish white colour; the word in commerce is used to denote a metallic ore, consisting of sulphur combined with the metal properly called antimony.

This sulphuret is also termed *crude antimony*, to distinguish it from the pure metal, commonly called *regulus*.

Crude-Antimony.—The grey or sulphurated antimony is the only ore of this metal found in sufficient abundance for the purposes of manufacture, and the treatment that it undergoes is extremely simple. The larger pieces of the earthy or stony matter being first picked out, the remainder is coarsely bruised, and subjected to a low red heat in close vessels, which melts the sulphurated metal and leaves the impurities behind. This process is usually performed in crucibles, whose bottoms, perforated with a number of small holes, are inserted into other crucibles; and the ore being put into the upper vessels, the melted metal runs through the perforations into the lower, leaving the stony impurities behind. A great number of these pots are arranged in one furnace, and their contents fused at the same time. As this method of charging a great number of crucibles was found to be a tedious operation, besides causing an unnecessary consumption of fuel, and a considerable loss by the breaking of pots, another plan has of late years been adopted in many of the French and Hungarian foundries. In them the melting pots are entirely discarded and the antimony is melted in mass in a reverberatory furnace, carefully covered with charcoal to prevent oxidation; the bed on which the ore is thus placed is upon an inclined plane, and when the fusion is complete a plug is withdrawn at the lower extremity of the bed, and the melted metal, separating from its gross impurities, flows into a receptacle placed there for that purpose. The sulphuret of antimony thus obtained is remelted, and cast into cakes or loaves, forming the *crude antimony* of commerce; and is found upon analysis to contain usually about 25 per cent of sulphur.

Regulus, or the pure metal, is obtained in various ways; but a preference is generally given to the following process, on account of its superior expedition to the others. The crude antimony is reduced to a fine powder, and mixed with nitre and tartar, a crucible is then made red hot, and very small quantities (spoonsfull) of the mixture successively thrown in, until the vessel is nearly filled: it is then covered, and a full red heat applied for half an hour, when the contents are either poured out into a greased iron cone, or suffered to cool in the crucible. The antimony, or regulus, is then found at the bottom of the crucible, covered with a saline scoriæ from which it is separated by the hammer. Care should be taken that the quantities of nitre and tartar be duely proportioned, otherwise not only the sulphur, but the antimony would be taken up by them. The usual proportions are four parts of crude antimony, with three parts of tartar, and one and a half of nitre. Another method of obtaining the regulus is by precipitation; this is done usually by fusing three parts of the sulphuret (crude antimony) with one of iron filings; when the sulphur from a superior affinity quits the antimony to combine with the iron. The metals capable of thus decomposing the sulphuret of antimony besides iron, are, copper, lead, silver and tin; whence originated five varieties of antimonial regulus known to the old chemists under the terms of martial, venereal, saturnine,

lunar and jovial. If copper be employed, it will take double the quantity to decompose the antimony; if lead, quadruple the quantity; their affinities for sulphur being weaker than that of iron.

Antimony when pure, is of a dusky white colour, between that of tin and iron. It is so brittle as to be easily reduced to a powder in a mortar. It is moderately hard, and may be cut with a knife. It melts at 810° of Farenheit. Its specific gravity according to Bergman is 6,86, Its fracture is usually broad foliated, but sometimes the facets are so minute as to give it an almost granular appearance. The primitive crystalline form it is difficult to determine. Native antimony is a mineral of very rare occurrence. When a mass of antimony has been slowly cooled, the convex surface is usually covered with the semblance of a radiated star. This circumstance induced the alchemists to pay great attention to antimony; in their heated imaginations they considered this appearance as a type or mysterious hint; they denominated it the eastern star that was to conduct the sages (themselves) to the cradle of their king; that is, to the making of gold, the king of metals.

If a crucible furnished with a plug at bottom is filled with melted antimony, and the plug be withdrawn as soon as a crust has been formed on the surface of the metal, there will be formed under the crust a beautiful variety of crystalline groups, consisting of cubes, of lengthened rectangular parallelopipeds, or ramifications made up of small octohedrans inserted one within another, and sometimes aggregated into trihedral pyramids.

The action of air and moisture upon pure antimony at the usual temperature is almost imperceptible; it does not even tarnish it for a considerable time, and rust never accumulates but very superficially; a fact if more generally known, might lead to the employment of it frequently as a substitute for other metals, in situations where the oxidation of them cannot easily be prevented. When however antimony is brought to a bright red heat, and then exposed to the contact of air, it is rapidly converted into a white oxide, which being volatile, rises in dense white fumes from the surface of the melted metal, and condenses in the upper part of the vessel in beautiful crystalline needles of a snowy whiteness; which have obtained the name of argentine flowers of antimony. Beaumé gives the following method of preparing them.

Place a wide cylindrical earthenware tube closed at one end in a wind furnace, so that it shall remain in a slanting direction, with the open end protruding a little way through a hole or door in the inside of the furnace; and to prevent the inside of the tube from being too much cooled, an earthenware stopper must be prepared to fit loosely into the open mouth of the tube. The apparatus being properly put together, light the fire, and when the bottom of the tube is red hot, introduce the antimony in small pieces, and close the mouth of the tube with the stopper. The metal being in a state of fusion, will soon commence to emit the vapour, and deposit the crystalline oxide in the upper part of the tube, from which it may be scraped from time to time with an iron spoon. The first portions

are generally yellowish, on account of a small quantity of sulphur usually contained in the metal; this is however soon burnt off, and the succeeding flowers are of a pure brilliant silvery white colour.

The oxide of antimony by hasty fusion in a crucible, is converted into a vitreous mass, which, when transparent, is of a yellowish orange colour, and is called *glass of antimony*; and when opaque it is of a brown colour, and hence has obtained the name of *liver of antimony*. Similar preparations are likewise obtained from the sulphuret, or crude antimony, with which they must not be confounded.

Antimony is dissolved by most of the acids; sulphuric acid is decomposed, sulphurous acid being disengaged, and an oxide formed, of which a small proportion only is dissolved in the remaining acid. Nitric acid dissolves this metal vehemently; muriatic acid acts on it by long digestion; but the most convenient solvent is the nitro-muriatic acid which with the aid of heat, dissolves it from the native sulphuret. With oxygenized muriatic acid it forms a compound of a thick fatty consistence, formerly called *butter of antimony*. This may likewise be formed, by exposing black sulphuret of antimony to the fumes of oxygenized muriatic acid, and subsequent distillation; or by distilling the powdered regulus with twice its weight of corrosive muriate of mercury. When the butter of antimony is dropped into distilled water, it is for the most port decomposed, and a white powder precipitates, which is called the powder of ALGAROTH, (which see page 59.)

The antimoniated tartar, or *emetic tartar* is the most important of the combinations of antimony with vegetable acids, as it forms a very valuable and powerful medicine. The most approved formula for the preparation is the following. Take of the sulphuretted nitrous oxide of antimony levigated, and acidulous tartrate of potash equal parts. Form a powder, which is to be put into an earthen or silver vessel with a sufficient quantity of pure water. Boil the mixture for half an hour, adding boiling water from time to time; filter the hot liquor, and evaporate to dryness in a porcelain capsule; dissolve in boiling water the result of the evaporation, evaporate till the solution acquires the specific gravity 1.161, and then let it repose, that crystals may be obtained, which by this process will be pure.

As this powerful medicine is frequently sold in the shops in a very adulterated state, we annex the following observations of "an old practitioner" on the subject, which has just appeared in the Quarterly Journal (for July 1825.) The writer says, "having repeatedly noticed a portion of insoluble matter in making the vinum antimonii tartarizati, I purchased some emetic tartar in crystals, and much to my astonishment was charged nearly double what I had previously paid for it in powder. I procured samples, from several respectable druggists, and found in all cases the same inconsistency in price. Upon careful examination, however, of the powder, this was explained, for I found in all the samples, after the triple tartrite had been carefully washed out by cold water, at least ten per cent. and in two or three much more, of a powder comparatively in-

soluble, and which proved to be principally supertartrate of potash, and tartrate of lime. I strongly suspect the manufacturers are in the habit, after boiling the tartar with the oxide of antimony and filtering, of evaporating immediately to dryness that portion which is to be sold in powder; this will explain its impurity, and also its cheapness, when compared with that which has been carefully crystallized. As uniformity in so active a medicine, is of so much importance, I would earnestly recommend my brethren of the profession to purchase this article always in crystals."

MISCELLANEOUS INTELLIGENCE.

Mechanical force exerted by moisture.—It is said that mill-stones are prepared in several parts of Europe by the following remarkable process. When a mass of stone has been found sufficiently large, it is cut into the form of a cylinder several feet in height, and afterwards divided horizontally so that each division shall form a mill-stone, by means of moistened wedges of wood. For this purpose circular and horizontal indentations are cut quite around it, and at proper distances, according to the thickness required for the mill-stones. Wedges of willow, that have been dried in an oven, are then driven into the indentations by means of a mallet. Thus situated the wedges are moistened, or exposed to the humidity of the night, and next morning the different pieces are found separated from each other.

What takes place to produce this effect has never been satisfactorily explained. It has been usual to ascribe it to capillary attraction, by which the water is caused to rise in the fine capillary tubes of which the wood consists; reasoning upon this supposition they proceed to calculate as follows. "Let us suppose the diameter of one of these tubes to be only the hundredth part of a line, let us suppose also that the inclination of the sides is one second, and that the force with which the water tends to introduce itself into the tube, is the fourth part of a grain: this force, so very small, will tend to separate the flexible sides of the tube, with the force of about 50,000 grains or 8¾lbs. In the length of an inch let there be only fifty of these tubes, which gives 25,00 in a square inch, and the result will be an effort of 21,875. As the head of a wedge, of the abovementioned, may contained four or five square inches, the force it exerts will be equal to about ninety or 100,000lbs; and if we suppose ten of these wedges in the whole circumference of the cylinder, intended to form mill-stones, they will exercise unitedly a force of 900,000 or a million of pounds."

Method of Browning Iron.—Take nitric acid two ounces; sweet spirits of nitre two ounces; spirits of wine one ounce; blue vitriol two ounces; tincture of steel one ounce. These ingredients are to be mixed, the vitriol having been previously dissolved in a sufficient quantity of water, to make with the other ingredients one quart of

mixture. Previously to commencing the operation of browning a gun-barrel, it is necessary that it be well cleansed from all greasiness and other impurities, and that a plug of wood be put into the muzzle, and the vent well stopped. The mixture is then to be applied with a clean sponge or rag, taking care that every part of the barrel be covered with the mixture, which must then be exposed to the air for twenty-four hours, after which exposure the barrel must be rubbed with a hard brush to remove the oxide from the surface.

This must be performed a second and third time, if requisite, by which the barrel will be made of a perfectly brown colour. It must then be carefully brushed and wiped, and immersed in boiling water in which a quantity of alkaline matter has been put, in order that the action of the acid upon the barrel may be destroyed, and the impregnation of the water by the acid be neutralized. The barrel when taken from the water must after being rendered perfectly dry, be rubbed smooth with a burnisher of hard wood, and then heated to about the temperature of boiling water; it then will be ready to receive a varnish made of the following materials; spirits of wine one quart; dragon's blood, pulverised 3 drs; shell lac, bruised 3 oz; and after the varnish is perfectly dry upon the barrel, it must be rubbed with the burnisher to give it a smooth and glossy appearance.

Exposure of Iron to Air in high Regions.—In an excursion made by M. Turmstein, and others to the summit of Monte Rosa, in August, 1820, an iron cross was fixed upon it, and left there. In August, 1821, M. Turmstein again ascended the mountain, and after great risks reached the summit and the cross. The iron was found not at all rusted, but had taken the colour of bronze. The barometer was at sixteen inches 4.2 lines. The thermometer 21° Faht. By calculation the height obtained was 14,086 feet. Water boiled at 185° Faht.—*Bibliotheque Universelle.*

Preservation of Anatomical Preparations.—Dr. Godman objects to the substances usually recommended for the preservation of anatomical preparations, such as saltpetre, common salt, corrosive sublimate, pyroligneous acid, in consequence of their action upon the edges of the knives; the two best as preservers of the substance being the worst as destroyers of the instruments. A better agent than any of the above, and one free from this great inconvenience is common whiskey. We fix a pipe into a large artery, and inject the whiskey until no more can be thrown in. It does not flow out by the bowels or mouth, as the solution of common salt, which may be attributed to the action of the spirit contracting the delicate extremities of the capillary vessels. In this way the whole of the muscular and cellular system is acted on, and if the skin be then sponged with impure pyroligneous acid, the body may be kept for a great length of time even in warm weather. *Silliman's Journal.*

Sharpening of Razors.—A correspondent has sent the following. "I have discovered a very excellent and easy method of putting a fine keen edge to a razor, which I have found so much advantage and

comfort from in shaving, that I am desirous of communicating it to the public through your medium. It is simply by whetting it on a soft mealy kind of stone, used by the engravers for taking out scratches upon their copper plates, and is called by them *snake stone.*

Plenty of oil should be used with it, and the razor blade being kept flat upon the stone, it will in a few minutes receive a fine, smooth, keen edge, free from wires so as to shave delightfully. Scarcely any stropping is requisite, merely a few rubs to clean the edge. I could never before get my razors so well set, as I now do them myself, which saves me both time and money."

"Whilst on this subject, I may perhaps be allowed to add another remark respecting razors; which is, that I believe it is a waste of money to buy more expensive razors than such as are retailed at about two shillings each. The blades of such are as good as can be made, all that follows to enhance the price, is nothing but ornament. Although the proper degree of heat requisite to give the right temper or hardness to a razor is well known, there are various circumstances apparently trifling to the uninitiated, which make a great difference in the temper: so that after all possible care, (in the common process) it becomes a matter of accident. If you buy half a dozen of such razors as I have mentioned above, all made alike, of the same material, and at the same time, you will probably find them all *tolerably good,* but one or two *very superior* to the others."—*Economicus.*

RECENT PATENTS.

DIVING APPARATUS.—To W. H. James, of Winson Green, near Birmingham, for an improved diving apparatus, which is also applicable to other purposes. 31st. May, 6 Months.

POWER LOOM.—To J. H. Sadler, of Hoxton, Middlesex, for an improved power loom for the weaving of silk, cotton, linen, wool, flax, hemp, &c. 31st. May,—6 months.

COAL GAS.—To J. F. Ledsam, and B. Cook, of Birmingham, for certain improvements in the production and purification of coal gas. 31st May,—6 months.

LACE NET.—To Joseph Crowder, of New Badford, Nottingham, for certain improvements in the pusher bobbin net machine. 31st. May,—6 months.

LIME.—To J. Apsden, of Leeds, for a newly invented method of preparing lime. 6th June,—6 months.

BLOWING MACHINE.—To Charles Powell, of Rochfield, Monmouth, for an improved blowing machine. 6th. June,—6 months.

TO READERS AND CORRESPONDENTS.

The next number of this Work will complete the Second Volume, and will therefore contain a general Index of the Contents.

The Communications of W. W.—A Mechanic, and E. Thomas, are under consideration.

J. J.—A Constant Reader.—L. A.—and H. L. will, if possible, appear in our next.

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REGISTER

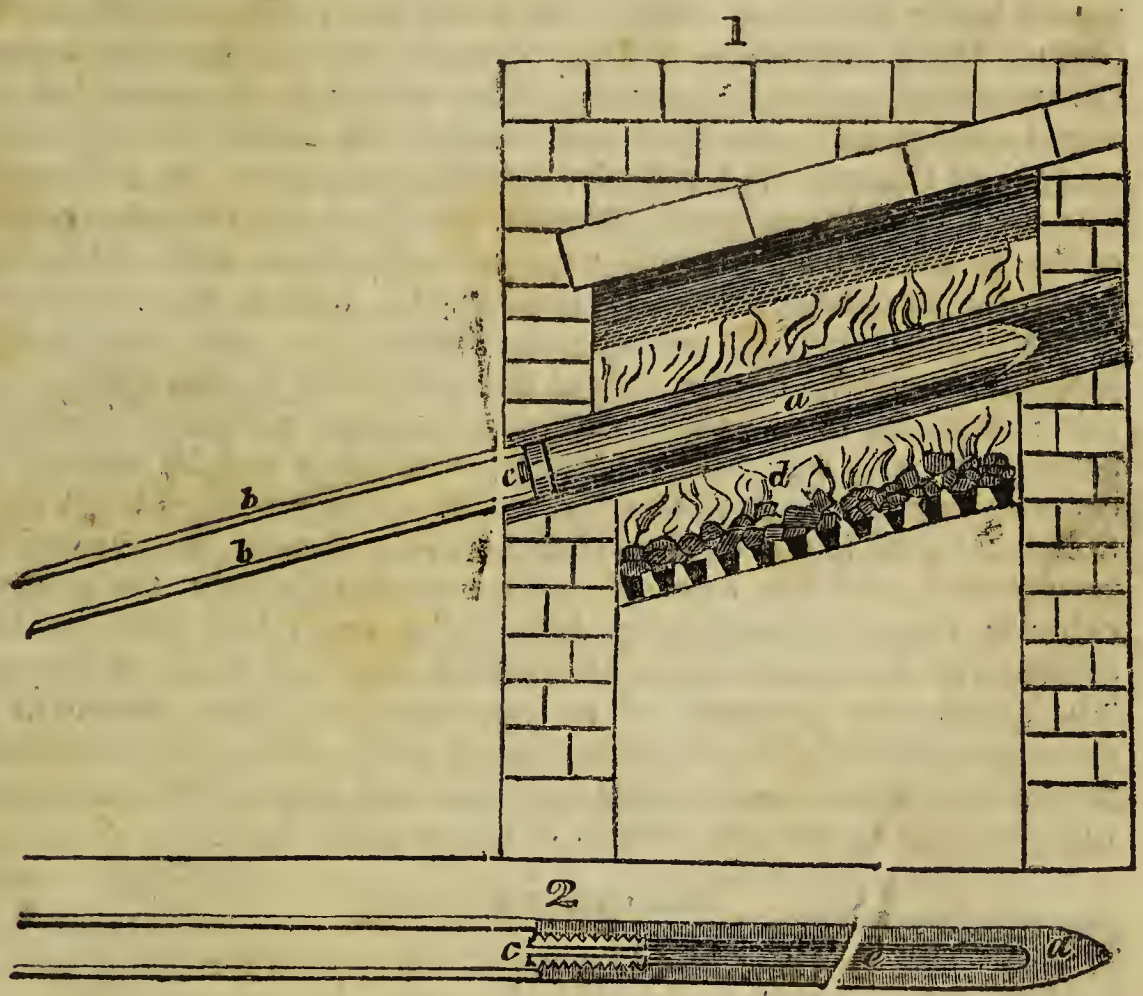
OF

THE ARTS AND SCIENCES.

No. 48.] SATURDAY, JULY 16, 1825. [Price 3*d*.

CONTENTS:

Perkins's Patent Machine for throwing Rockets, Shells, and other Projectiles by Steam - - - 369
New Application of Steam - 370
Description of Church's Patent Boring Instrument, the originality of the Invention disputed. 374
Specification of Isaac's Patent for "Certain Improvements on the Construction of Machinery, which when kept in Motion by any suitable Power or Weight, is applicable to obviate Concussion by means of preventing Counteraction, and by which the Friction is converted into an useful Power for propelling Carriages on Land, Vessels on Water, and giving Motion to other Machinery - 371
INDEX to the Second Volume.



PERKINS'S PATENT MACHINE FOR THROWING ROCKETS, SHELLS, AND OTHER PROJECTILES.

THIS invention consists in employing the expansive force of heated water to expel projectiles from a tube, instead of gunpowder or other explosive mixtures. For this purpose, the water is inclosed under considerable pressure in a chamber or bore of the projectile, and after being heated to a high temperature, it is allowed to escape in the form of steam; and the resistance which the atmosphere opposes

to the rush of the vapour causes the rocket to be driven forward in its course. On this principle the patentee proposes to discharge a variety of projectiles, but the apparatus described in his specification is constructed in peculiar for the discharge of rockets.

Fig. 1 gives a section of a rocket *a* made of wrought iron; *c* is the cavity or bore to contain the water, which is connected to the guide rods *b b*, (usually termed rocket sticks) by means of a screw piece fixed stationary in the tail of the rocket. This screw-piece has an aperture or perforation of small calibre at *c* throughout its length, for the purpose of charging the rocket with water, the bore of which is completely filled, including about one tenth of the small aperture. Into this small aperture a plug of brass, or other metal is then forcibly driven in, so as to confine the water under considerable pressure. The rocket thus prepared is then placed in the furnace *d*, *(Fig. 2.)* in a cast iron cylinder which passes through the furnace in an oblique direction, so as to give the rocket the required angle of elevation. The rocket is therefore not in actual contact with the fire, but receives its caloric through the medium of the cast iron cylinder, which also serves as its guide. The cylinder being previously heated, quickly raises the temperature of the projectile, and melts, or drives out the brass plug, when the water instantaneously flashes into steam, with a force adequate to the propulsion of the rocket to its destination; that force being proportioned to the degree of heat communicated to the water. In this respect the invention is peculiarly felicitous, as it may be readily adapted to give any degree of impetus which it may be desired to communicate to the projectile; all that is necessary being to fix such a metallic plug in the small perforation, as will melt at the required temperature, and thus throw it to the intended distance, the guiding cylinder being of course elevated to the angle best suited to the situation of the object aimed at, and the impelling force employed. The plugs may be made of various metals or alloys, fusible at a temperature below that of iron, so as to melt, soften, or otherwise yield to pressure, exactly when the water has acquired the necessary temperature, to flash into steam of the required force.

NEW APPLICATION OF STEAM.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IN the Register of the 18th of June you gave an account of Mr. Evans having applied waste steam to undergo combustion as an auxiliary to the fuel employed.

"I beg to inform you that such application is a direct infringement on the Patent granted to Messrs. Gilman and Sowerby, on the 13th of April last, which can be verified whenever the case may require.

"Therefore I must request the favour of your giving this publicity in your next number, by way of caution to all persons who may contemplate the before said application.

"Mr. Evans has received a direct communication to the same effect.

"I am, Sir,

"*Birchin Lane, Cornhill,* "Your humble Servant,
"*7th July,* 1825. "WM. GILMAN."

SPECIFICATION of a Patent granted to the Rev. Moses Isaacs, of Houndsditch, in the City of London, for his invention of "*Certain improvements in the construction of machinery, which when kept in motion by any suitable power or weight, is applicable to obviate concussion by means of preventing counteraction, and by which the friction is converted into an useful power for propelling carriages on land, vessels on water, and giving motion to other machinery.*"

"* I, the said Moses Isaacs, do hereby declare, that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the drawings hereunto annexed, and the following description thereof (that is to say) my Improvements, in obviating concussion by means of preventing conteraction in propelling carriages on land, consist in an improved wheel, and also a rod or base falling by its own gravity to prevent carriages overturning, which will be hereafter described. Secondly, my improvements in obviating concussion by means of preventing counteraction in propelling vessels on water, consist in an improved construction of the machinery for steam vessels, which machinery is also applicable in giving motion to other machinery.—In further compliance with the said proviso, I, the said Moses Isaacs, do hereby declare, that the manner in which the same is to be performed is as follows:

"My improvements in propelling carriages lie in the construction of a wheel; the spokes D, *Fig.* 1, are made of any elastic material, and fitted to the nave at the back quarter by means of grooves, two hoops being fixed on the nave, one on each side, in order to keep the springs in their proper places; the axle is fixed in the nave, and made to revolve in a cap or cover attached to the carriage. The object of this wheel is to prevent the concussion so much experienced by the ordinary wheel of carriages, also the load or weight placed on or in the carriage after being started by the horse or other animal, assists materially in propelling itself. The rod and case, or tube, may be made of any suitable material for preventing carriages overturning. The rod I make with teeth or notches, as shewn at A, *Fig* 2, fitting into the case or tube B; at the bottom of this case or tube there are one or more springs to prevent the rod returning after it has fallen. This rod and case, or tube, are suspended near the top of the carriage by means of a knuckle joint or hinge, K; I also make use of a bar, *Fig.* 3, to prevent the carriage proceeding after the rod or case has fallen, which is fixed on the front of the

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* The preamble is omitted as unnecessary.

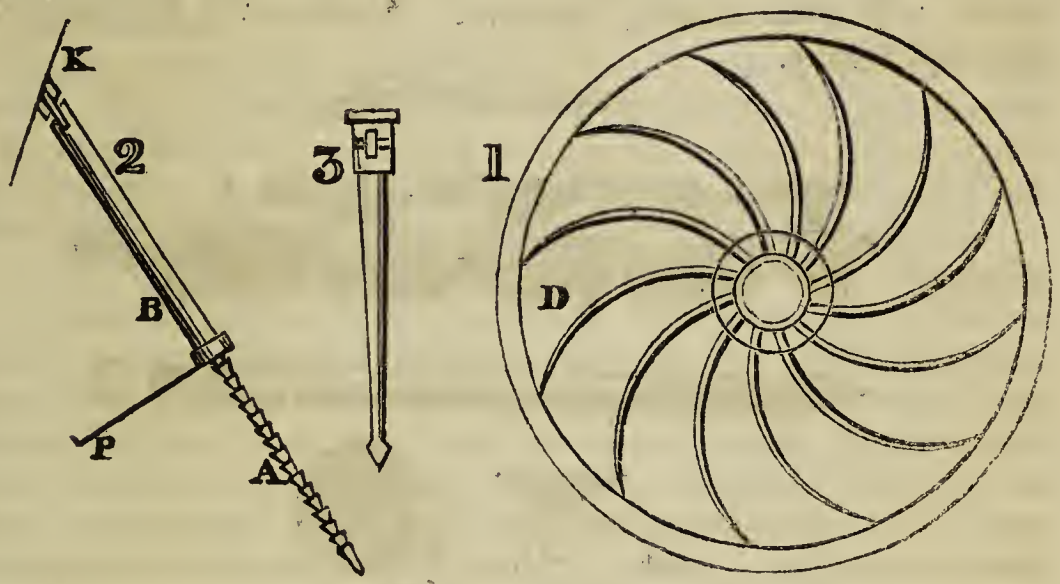
hind axle, or other convenient place, and is kept up by the rod P, passing under the coach from the case or rod.

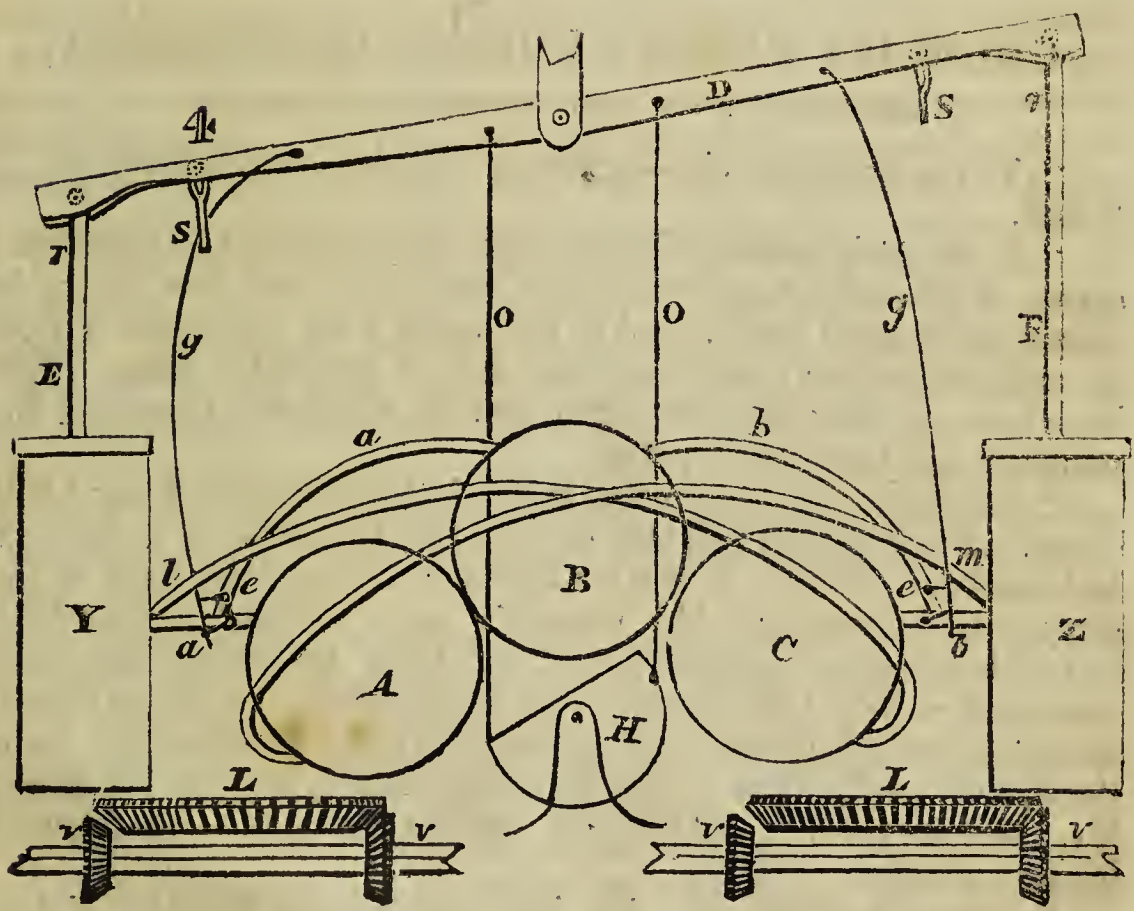
" I shall now describe my improvements in propelling vessels, and giving motion to other machinery.—A B C are three boilers, B being placed upon A C; D is a beam made in the form of a scale beam. E F are the piston rods (made hollow) with rollers at the top, working in the gutter or groove *r r*; near the ends of the beam D, connecting rods S S are suspended to the same beam, which work the cranks or cog wheels hereinafter mentioned, with rollers as above described; Y Z are two cylinders, *a a* are feeding pipes passing from the boilers A B into the cylinder Y; *b b* are also feeding pipes passing from the boilers C B, into the cylinder Z: this method of conducting steam is applicable to large vessels on water, or to engines on land; but for small vessels it is advisable to conduct the steam through pipes from B C into cylinder Y, and from A B into cylinder Z; otherwise the sudden forcing of the steam from the boilers A B, would cause a small vessel to rock. *l* is a pipe from the cylinder Y, near the bottom of the boiler C; to recover the steam from the cylinder, into the boiler C, is also a pipe from the cylinder Z, into the boiler A, instead of the usual means of condensing it. H is an oven, or trough, or grate, made in the form of a half cylinder, moving from side to side by means of the rods O O, suspended from the beam D (acting in points or centres); the ordinary grates or ovens may be used by applying shades to exclude the heat from the boiler A whilst acting against B and C; in same manner from C, when it is acting on A B, and thus continually having two boilers acting against one. *g g* are two springs or rods from the beam D to the cocks *e e*, on the feeding pipes *a a* and *b b*. The fire acting on the boilers A B, causes the steam to lift the piston E, and consequently depresses the piston F, and forces the steam from the cylinder Z into the bottom part of the boiler A, through the pipe *m*, and (vice versa) on the other side before described; any flame or heat may be used by means of the moveable fire or shades.

" Another mode by which I save the loss by friction is the application of faced cog wheels, L L, placed from midship to midship, on shafts or axles, and are connected by connecting rods from the beam D, by means of a button or crank working the pinions *v v v v*, attached to the axles or shafts of the paddles; the diameter of the friction rollers is 6 to 1 of the diameter of the points of the axles, and are applied on their own points in gunnerals nearly under the paddle axle (applied at both ends) from fifteen degrees, more or less, from its ascent to its descent, from the vertical to its inclination.

" Having now described my invention, I proceed to name those parts to which I claim exclusive right; first the application of spring spokes to wheels as before described, and also the method of preventing carriages overturning, which may be done by the rod falling and the case or tube suspended to the carriage, or by the rod being suspended, the case or tube falling; and likewise the teeth or notches may be either on the rod as abovementioned, or in the case, the springs being then fixed to the rod. In the construction of the machinery for propelling vessels, I claim the method of excluding the heat from

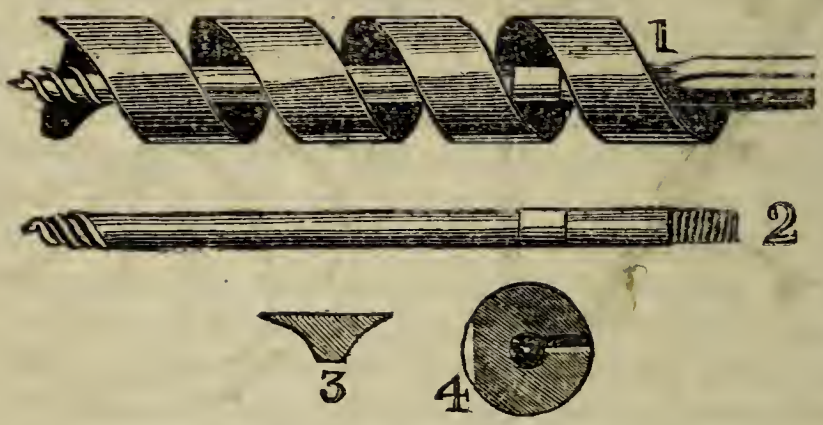
one boiler while it is acting on two, as before described, by which means fuel is saved, by conducting the same steam out of one cylinder into the boiler; the application from midship to midship of the above described machinery, whereby I obviate the concussion by means of preventing counteraction, and thereby turn that power before lost to the increasing of the velocity or speed of navigable vessels. In witness whereof, I, the said Reverend Moses Isaacs, have hereunto set my hand and seal, this 19th day of August, in the year of Lord 1824."





We have given the specification of these "*certain improvements*" verbatim; because the discoveries assumed to be made are of a very extraordinary and important nature; and entertaining opinions widely different from those of the patentee as to the advantage of his invention, we were fearful that *our* description of the

machinery would appear so preposterous as to be considered inaccurate. Nevertheless it must be admitted, that there is considerable novelty, as well as ingenuity, in the mode of working three boilers; and although we doubt their applicability to steam-engines, we think it probable that some modifications of this singular apparatus may be turned to account in some particular processes in the arts.—The public may possibly derive some advantage from the hints thus thrown out, but we feel assured (while we lament it) that the inventor will gain nothing whatever in return for his sacrifices of time and money.



CHURCH'S PATENT BORING INSTRUMENT,

ORIGINALITY OF THE INVENTION DISPUTED.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"In the 44th number of your work, you mentioned an intention of giving at the earliest opportunity an account of two new boring instruments of great merit, and at the same time expressed a desire for any information respecting that one in particular whose effects have been so much blazoned forth, and for which Mr. Church of Birmingham has taken out a patent.

"Being somewhat interested in this latter invention, I was a little chagrined to find that you had omitted all notice of it in your two last numbers, because it was my intention to assert my claim to priority in this invention; Mr. Church's auger for boring wood being in fact but another application of my auger for boring the earth, described in your 13th number, and fortunately accompanied with an engraving, which prevents all mistakes. It was published by you on the 3rd of April, 1824; that is, seven months prior to the date of Mr. Church's patent, and thirteen months before the enrollment of his specification.

"I am well aware, Sir, that in a work like the Register of Arts, long disputations in matters of this kind, are inadmissible; I shall therefore as briefly as I am able, describe Mr. Church's patent, leaving it to your readers to judge how far I am justified in asserting my claim as the original inventor.

"The specification states that the invention consists in certain improvements in augers or boring bits, (being used as either); that

the instrument is of a helical figure, and formed by winding a bar of steel of a peculiar shape round a cylindrical mandril, by which a circular hole is formed throughout its length for the insertion of a moveable central guide pin; the upper end of this central pin is screwed into the shank of the auger, and the lower or working part is furnished with a wood screw; the office of the latter is to draw the auger into the wood as it is turned, the cutting edges on the helical part at the same time clearing away the wood as the auger deepens in the perforation.

"In the accompanying drawings, *Fig.* 1. represents the auger complete; *Fig.* 2. the central guide pin separately; *Fig.* 3. an end view of the steel bar, of which the helical part of the auger is formed; *Fig.* 4. an end view of the auger showing the cutting edges, and the central hole for the reception of the moveable guide pin.

"It will be seen by the figure of the steel bar shewn in section *Fig.* 3. (which the patentee calls a *mixtilinear trapeziod)* that it has two flat sides parallel to each other, of unequal breadth; and two concave sides equal to each other and forming very acute angles with the broad flat side; and that when this bar is wound spirally round like the threads of a corkscrew, and the auger held in a vertical position, these concave sides will be immediately above each other; and represent the hollow side of a gouge. The upper concave side is therefore formed into an instrument similar to what is called a a firmer gouge, by grinding away the steel from underneath, upon the angular edge of a grindstone in a curved line nearly parallel to the upper surface; to which an edge is afterwards given. A rule should be observed in forming this part of the instrument, which is very essential, namely, that the cutting angle of the gouge, should be the same as the angle of inclination of the conducting screw; or rather that the latter should conform to the proper angle of the former. The reasons for this being obvious I omit giving them. The upper portion of the steel bar, being ground away as described, the lower is also ground upon the edge of a grindstone and shapened into a vertical cutting edge like the point of a knife, which entering the wood previous to the gouge, circumscribes the hole, and by making a circular incision, prepares the gouge for clearing out the wood cleanly and regularly.

"In grinding and sharpening the edges of this auger, the central pin is of course removed for the purpose, and it is obvious that the edges may be ground and sharpened as long as any of the spiral steel bar remains, which renders the instrument extremely valuable, as one may thus be made to last more than a man's life time. The rapidity and facility with which this instrument cuts its way into the wood, far surpassing all other inventions of the kind, you have already noticed in your work.

"I have therefore only to state, in a very few words, that all that is remarkable in this instrument was previously invented by me, and published in your work as before stated; and those parts not borrowed from me, are "as old as Aldgate." The central screw is at least a thousand years old, and the cutting edges, in connection with the central screw of an auger, have been also a long while in use.

"The bar I used for making the worm to my auger was very similar to that described by Mr. Church; and the manner of forming it the same, namely, by winding it helically round a cylindrical mandril, which is in fact the ordinary process: but having occasion for a square bar as my central guide in boring the earth, I filled up the circular passage with segments so as to reduce it to a square form. With respect to the cutting tools I distinctly stated in my account that it was evident that various kinds of tools might be fixed to the bottom of the auger, according to the nature of the substances to be perforated; and the particular shaped edges ground up by Mr. Church, result from the peculiar form of the bar. And it cannot be supposed that when I must have necessarily contemplated the boring through all kinds of substances, vegetable and mineral, that wood was never thought of; the modifications for that purpose adopted by Mr. Church, however judicious and excellent, are perfectly obvious to persons acquainted with matters of the kind.

"To conclude, I beg distinctly to state, that I do not positively charge the patentee with having pirated my invention, as it is possible the idea may have originated in his own mind; but there is a very strong *probability* that he has availed himself of my hints, and I am glad to see he has made such good use of them. The fact is however on record in your widely circulated Journal, that I was the original inventor of the principle, at least. L. H."

TO READERS AND CORRESPONDENTS.

The appearance of the annexed Index renders it almost unnecessary for us to announce that our present Number completes the Second Volume of this Work; in presenting which to our readers, we feel less diffidence, on account of the uniform assurance of our immediate friends, that it contains a more choice selection of novel and interesting matter than its predecessor; and from the new and valuable sources of intelligence recently opened to us, we have the utmost confidence in believing that our Third Volume will as much surpass the second as the second has the first.

The price of the *volumes* in boards is 6*s*. 6*d*. each; any portion of which may be had in *parts*, (containing 4 numbers) at 1*s*. each; or in single *numbers* price 3*d*. each, as heretofore. Those recent numbers containing descriptive accounts of the Locomotive Coaches now building,—the new Rail-ways—the Brick-making Machine—Mechanism of the Diorama—the new Vacuum Engines, and other novel and popular subjects have been reprinted.

Our Correspondents are requested to send their Communications in future to Mr. Capes's Library, at No. 111, Fleet Street, who will publish the succeeding numbers of the work.

T. S. will perceive that we had anticipated his wishes.

A Constant Reader, and H. L. must grant us a little further indulgence.

Plain Sense,—A Seaman,—L. O.—S. W.—and Tilbury, are received.

The second Letter from D. N.....N is just received, and will be replied to by the post.

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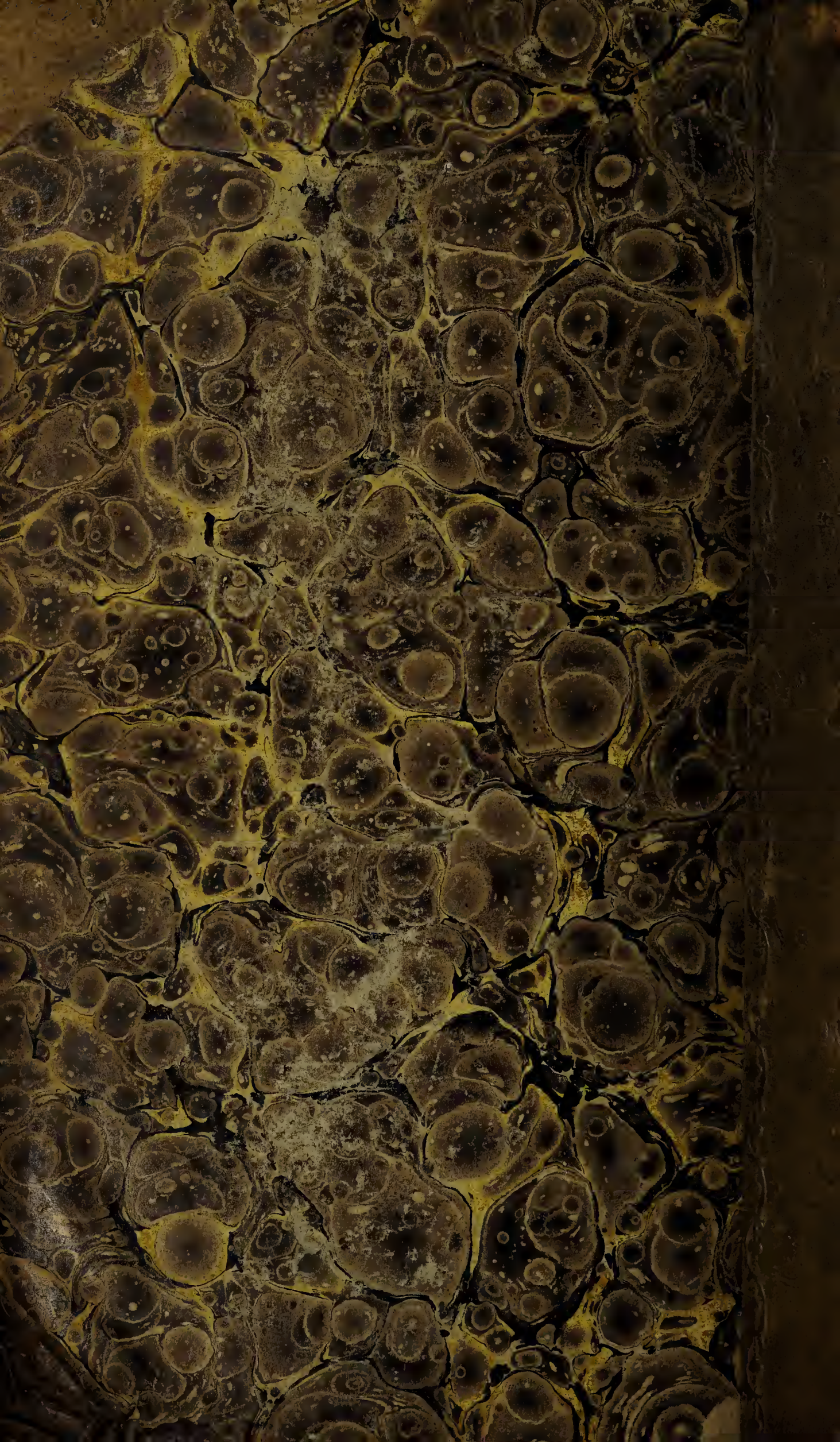
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